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THE MARKET OUTLOOK AND PROSPECTIVE COMPETITION FOR UNITED STATES RICE IN THE WESTERN HEMISPHERE

by

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FOREWORD

This report presents the results of a survey of the rice-producing and consuming countries of the Western Hemisphere which was made in the summer of 1949 in the interests of the United States rice industry. The study had two major objectives: (1) To appraise the probable competition to be expected from the surplus-rice areas of Latin America, and (2) to evaluate the possibilities of marketing United States rice in the deficit-rice areas of the Western Hemisphere. Other objectives included a descriptive study of the production, milling, and marketing methods in the major areas to accumulate a background of basic facts for use in appraising changes that occur in these areas in the future.

Dr. J. Norman Efferson, while on leave from his duties as Agricultural Economist at the Louisiana State University and Agricultural and Mechanical College, conducted the first-hand study for this Office. The year before he conducted a similar study of the major rice-producing countries in the Far East, the Near East and southern Europe and included the importing countries of Western Europe. The report covering these 19 countries was published by the Office of Foreign Agricultural Relations in June 1949 as Foreign Agricultural Report No. 35 entitled "The Market Outlook and Prospective Competition for United States Rice in Asia, the Near East and Europe".

Both studies were conducted under the provisions of the Research and Marketing Act of 1946. The possibilities of broadening the foreign market for other agricultural commodities also are being studied by this office, and the findings are presented in other circulars and reports that may be obtained, free, from the Office of Foreign Agricultural Relations, United States Department of Agriculture, Washington 25, D.C.

Joseph A. Becker

Joseph A. Becker
Chief International Commodities Branch

FIGURE 1. Weed control is one of the major problems facing rice producers. Here, growers and Government workers discuss new methods of control in central Colombia.

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FIGURE 2.

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FIGURE 3.

FIGURE 4. Expanding rice production often requires the opening of new land. Typical wasteland of the type that is being reclaimed, in Cuba.

C O N T E N T S

THE MARKET OUTLOOK AND PROSPECTIVE COMPETITION FOR UNITED STATES RICE IN THE WESTERN HEMISPHERE

by

J. Norman Efferson, Agricultural Economist

OUTLOOK

United States rice markets in the Western Hemisphere should be reasonably stable for the remainder of the 1949-50 marketing season (August-July) and possibly throughout 1950. Rice exports from the United States to Western Hemisphere countries during this period are expected to be only slightly less than the peak wartime level.

Within 1 to 3 years thereafter, however, demand for United States rice in the Western Hemisphere is likely to decline. Total export supplies of the producing countries may decrease somewhat but will remain larger than prewar levels. In addition, most of the deficit countries are expanding production. The markets in Asia available for some of the exporting countries of the Western Hemisphere during recent years are not likely to be maintained. This will cause more of the export supplies of the Western nations to be available for nearby countries, thus intensifying competition.

As an exporting country the United States has a good opportunity to maintain its fairly large rice market in the Western Hemisphere. Since much of the rice produced in the other Western Hemisphere countries is not so high in quality as that now preferred by some importing countries, the competitive position of United States rice in the large export markets of Latin America is better than that of most of the exporting countries. Too, inflation in some of the producing areas of Latin America is raising their export prices above those of the world market.

There is a possibility that a highly profitable market for good-quality seed rice can be developed in several rice-producing countries of Latin America, including Chile, Colombia, Cuba, and Ecuador. Producers and growers in many areas have become interested in producing higher quality rice and in the possibilities of obtaining clean seed of uniform high-quality varieties from the United States.

RICE PRODUCTION AND TRADE

Total exports of rice from Western Hemisphere countries in 1948 were about four times as great as in the prewar period. Shipments from surplus regions amounted to about 1.7 billion pounds of milled rice in 1948, compared with slightly more than 400 million pounds annually in the 1936-40 period. Of the 1948 volume, about 870 million pounds came from the United States and 800 million pounds from the exporting countries of Latin America (table 1). In the prewar years as in 1948, United States exports exceeded the combined exports from the other Western Hemisphere countries.

Although there were variations among the countries from year to year, rice-export supplies from the United States increased at about the same rate as those from other countries. Preliminary export data for 1949 indicate that, while United States exports will be larger than in 1948, trade from some of the other countries will be smaller and total supplies exported may be reduced below the 1947 and 1948 levels.

Due to the sharp increase in rice exports from the Western Hemisphere as a result of the war the region shifted from a net importer of about 500 million pounds annually, to a net exporter, of about 1 billion pounds. In the 1936-40 period, annual exports from surplus countries, including the United States, averaged about 400 million pounds. At the same time, annual imports amounted to almost 900 million pounds, making the net deficit about 500 million pounds. Most of this deficit was met by imports from the surplus areas of Asia. In 1948 on the other hand, total exports from Western Hemisphere countries approximated 1.7 billion pounds and total imports, 700 million pounds, leaving a net surplus of about 1 billion pounds. Much of this surplus was exported to Asia, where the war caused a decrease in the production of exporting countries.

The change-over in the Western Hemisphere from the prewar status as a deficit-rice region to the current position of a surplus-rice region has been the result of a rapid expansion of acreage and production in other countries as well as in the United States. The rice acreage of the Western Hemisphere averaged 4.3 million acres annually in the 1935-36/1939-40 period but increased to 7.9 million acres in 1948 (table 2). Annual production, which averaged 152 billion bushels of rough rice in the prewar period, rose to about 270 billion bushels annually from 1947 to 1949.

This crop increase has been fairly uniform in the principal producing countries. From the prewar period to 1948 the rice acreage of South America increased 83 percent; that of Central America and the Caribbean 93 percent; and of the United States 74 percent. Current forecasts of 1949 acreage and production in the United States indicate that acreage will be about 80 percent above the prewar average and production nearly 75 percent above.

The gain in the rice production of the Western Hemisphere has caused significant changes in the marketing of this crop within the Hemisphere but has had less effect on world rice markets. In the prewar period the rice acreage of the Western Hemisphere was 2 percent of the world total. Although acreage had almost doubled by 1948, it then represented only about 3.7 percent of the world acreage. The total production of the Western Hemisphere in relation to the world harvest increased a little more rapidly than the acreage because of the unusually low prewar yields per acre in many Asiatic areas.

A significant change did occur in export supplies, however. Although the Western Hemisphere supplied only 2.1 percent of the rice moving into world export channels in the prewar period, its 1948 exports were 19.2 percent of the total. Prewar world exports averaged 20 billion pounds of milled rice annually, of which the Western Hemisphere furnished 400 million pounds, but the total world shipments in 1948 were only ap-

TABLE 1.- *Western Hemisphere: Rice exports and imports (in terms of milled), average 1936-40, annual 1946-48*

COUNTRY	AVERAGE 1936-40		1946		1947[1]		1948[1]	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
	1,000 pounds	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
South America:								
Argentina	467	52,286	8,638	1	5,955	-	-	-
Bolivia	0	18,371	-	25,079	-	9,469	-	20,005
Brazil	83,335	0	362,422	-	530,885	-	475,296	-
Br. Guiana	34,296	5	50,671	-	43,962	-	39,267	-
Chile	3	24,107	78,497	-	5,954	-	1,252	-
Colombia	3	29,614	14,178	1,029	-	13,452	-	9,921
Ecuador	25,685	4	147,528	-	138,847	-	138,853	-
Fr. Guiana	0	2,692	-	1,870	-	913	-	1,892
Paraguay	0	327	0	101	0	0	(2)	882
Peru	51	44,742	0	6,702	0	(2)	0	5,071
Surinam	10,654	4	-	-	-	-	38,897	-
Uruguay	3,775	191	1,545	4,723	-	-	27,196	-
Venezuela	0	32,924	-	33,995	-	29,235	-	33,000
Total	158,269	205,267	673,479	73,500	725,603	53,069	720,761	70,771
Central America, the Caribbean and Mexico:								
Br. Honduras	-	2,764	-	3,426	-	2,497	-	2,627
Costa Rica	0	2,053	1,000	11	1	24	1,624	715
Cuba	60	444,612	1	330,464	1	620,639	-	517,715
Dom. Rep.	165	7,989	8,397	(2)	1	8,167	511	-
El Salvador	2,641	3	547	-	8,012	-	4,126	-
Guatemala	(2)	75	(2)	567	1,135	2	259	1
Honduras[3]	1	2,591	728	1	4,856	37	3,187	-
Mexico	18,555	347	3	3,293	22,090	4,460	63,049	42
Panama	-	13,398	-	7,222	-	14,637	-	10,559
Nicaragua	150	518	11,228	0	8,023	-	8,195	-
Trinidad	-	42,376	-	24,173	-	20,608	-	27,229
Bahamas	-	3,809	-	2,270	-	1,669	-	-
Barbados	-	20,675	-	16,059	-	13,432	-	5,544
Jamaica	-	41,798	-	14,947	-	11,521	-	-
Guadaloupe	-	15,467	-	8,349	-	10,040	-	12,802
Martinique	-	6,508	-	5,240	-	7,013	-	-
Haiti[4]	1	2,359	2,357	(2)	1,544	(2)	219	826
Total[5]	22,044	619,329	24,261	425,022	45,663	724,246	81,170	614,560
Total South and Central America and the Caribbean	180,313	824,596	679,681	498,522	769,078	777,315	801,931	685,331
United States	235,206	20,534	772,592	3,483	963,002	610	868,565	2,845
Canada	2,525	50,958	3	26,018	6	38,441	5	38,794
Total: Western Hemisphere	418,044	896,088	452,576	528,023	1,732,086	816,366	1,670,501	726,970

[1] Preliminary.
[2] Less than 500 pounds.
[3] June-July.
[4] October-September.
[5] Including countries not shown.

Office of Foreign Agricultural Relations. Prepared on the basis of official statistics of Foreign governments and reports of U.S. Foreign Service officers.

TABLE 2.- *Western Hemisphere: Rice acreage and production, average 1935-36/39-40, annual 1946-47 to 1948-49*

COUNTRY	ACREAGE				PRODUCTION			
	AVERAGE 1935-36 TO 1939-40	1946-47	1947-48[1]	1948-49[1]	AVERAGE 1935-36 TO 1939-40	1946-47	1947-48[1]	1948-49[1]
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*	*1,000 bushels*
South America:								
Argentina	52	122	128	128	3,112	5,928	5,497	5,879
Brazil	2,323	4,166	4,095	4,152	66,424	132,779	124,800	120,000
Br. Guiana	70	98	107	95	3,559	4,993	4,760	4,976
Chile	13	80	70	60	1,299	4,274	4,381	4,035
Colombia	-	-	-	375	3,142	7,410	10,230	10,887
Ecuador	-	-	-	-	3,245	8,494	6,596	8,700
Paraguay	5	12	10	20	196	367	416	857
Peru	107	114	132	94	4,578	7,261	10,132	6,420
Surinam	37	40	-	45	1,703	2,507	1,889	2,861
Uruguay	13	25	31	33	866	1,723	1,824	2,095
Total	2,914	5,339	5,254	5,336	88,754	177,379	171,851	164,943
Central America and the Caribbean:								
Costa Rica	28	33	30	30	935	1,120	952	918
Cuba	45	107	105	123	965	2,400	2,870	3,000
Dominican Republic	80	87	77	114	2,905	3,951	3,243	4,229
El Salvador	26	34	40	39	700	1,368	-	1,265
Mexico	95	157	179	183	4,007	6,760	6,752	7,350
Panama	50	114	128	134	1,600	2,669	2,987	3,691
Total	421	676	719	814	13,347	21,997	22,054	25,131
Total, South and Central America and the Caribbean	3,335	6,015	5,973	6,150	102,101	199,376	193,905	190,074
United States	1,004	1,574	1,693	1,743	49,852	72,216	78,259	81,170
Total, Western Hemisphere	4,339	7,589	7,666	7,893	151,953	271,592	272,164	271,244

[1] Preliminary.

Office of Foreign Agricultural Relations. Prepared or estimated on the basis of official statistics of foreign governments and reports of U.S. Foreign Service officers.

proximately 8.7 billion pounds, of which 1.7 billion pounds came from the Western Hemisphere. Preliminary data on 1949 world export supplies indicate that although shipments for the year will be slightly larger than those for the preceding season they will be less than three-fourths of the prewar level.

Although crop and export supplies in the surplus countries of Asia have not regained prewar levels, imports by the areas of Asia having shortages are likely to be less, inasmuch as the decreased output willbe offset largely by the reduced effective demand for available export

supplies.[1] In addition, a shortage of dollar exchange in most of the deficit-rice countries of Asia is likely to prohibit important purchases from the Western Hemisphere for a number of years. Much of the surplus rice supplies of North America and South America therefore must be marketed within the Western Hemisphere or in Europe. This means that the United States rice industry must expect increased competition for its rice markets in the Western Hemisphere.

There is little possibility that the Western Hemisphere will revert to its prewar status as a region having a net deficit in rice. There are some indications, however, that the current high rice export levels from surplus countries other than the United States will not be maintained. In some countries, higher costs of production combined with declining world prices have caused decreased production. In other countries, domestic needs have resulted in the use of an increasing volume of rice for home consumption with the result that available export supplies are less. Assuming that the United States industry continues to meet world price competition and markets the quality of rice desired by the importing countries, there is an excellent opportunity of maintaining most of the Western Hemisphere markets and a possibility of less competition from surplus areas within 2 to 5 years.

SURPLUS RICE REGIONS

Brazil

Brazil is the fourth largest country in the world and the largest producer of rice in the Western Hemisphere. Rice is produced in every major area and is one of the most important domestic foods. Most of it is grown for local use. It is largely of the upland type, cultivated without irrigation on rolling-to-hilly land. Southern Brazil, however, grows most of its crop on large farms where the fields are irrigated and cultivation and harvesting are semimechanized. Brazil's export supplies have come largely from this section, and it will continue to be one of major commercial production.

Brazil is likely to be less important in the world rice trade in the next 5 years than it was from 1945 to 1948. Although production probably will continue to increase gradually, supplies to a large extent will be utilized domestically because of the growing population and because Brazilians are having to substitute rice for wheat, which is not being imported in sufficient quantities to meet local needs. In 1949, this increased local demand for rice resulted in a marked reduction in exports.

There is little possibility, however, that Brazil will discontinue rice exports. Growers in the major commercial area in the State of Rio

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[1] The Market Outlook and Prospective Competition for United States Rice in Asia, the Near East, and Europe. Foreign Agriculture Report No. 35, Office of Foreign Agricultural Relations, U. S. Department of Agriculture. June 1949.

Grande do Sul are planning to expand rice acreage. This State, with climatic and soil conditions similar to those in Arkansas in the United States, produces good-quality short-grain rice, which competes with similar types produced in the important exporting countries of the world. Brazil is likely to stimulate exports of such products as rice that can be sold abroad for dollars. Thus, this country can be expected to continue rice exportation, although on a reduced basis, as compared with the years 1945 to 1948.

In recent years, more than 90 percent of Brazil's export supply has been of short-grain rice very similar to the type and quality produced in California. In the future the major portion of Brazil's supplies for sale abroad can be expected to be of the same varieties. United States producers can expect some competition from Brazil in short-grain rice but little competition in our long-grain rice markets of Latin America and Europe.

Production, Consumption, and Trade

The total Brazilian acreage planted to rice in 1948-49 - more than 4 million acres - represents an area more than twice that sown in the United States. The acreage was almost twice as large as the prewar average. Data show that the acreage in the 5-year 1931-35 period averaged 2.1 million acres annually and in 1936-40, it averaged 2.3 million acres. The average yield of from 28 to 30 bushels, or around 8 barrels per acre, has been relatively stable since 1930; and total production has been increased in proportion to the expansion of the area planted. Brazil produced 66.4 million bushels of rough rice annually in the 1936-40 period and a peak more than double this prewar level in 1946 (table 3). The most recent forecast as to the 1948-49 production (harvested from March through June 1949) is 4.2 million acres and approximately 120 million bushels of rough rice.

The three major producing States are Rio Grande do Sul in the south and Sao Paulo and Minas Gerais in central Brazil. Since most of the

TABLE 3.- *Brazil: Rice production by States, average 1936-40, annual 1946-49*

STATE	AVERAGE 1936-1940	1946	1947	1948	1949[1]
	Million bushels	*Million bushels*	*Million bushels*	*Million bushels*	*Million bushels*
Sao Paulo	19.2	46.5	42.0	40.8	33.4
Rio Grande do Sul	14.2	31.7	33.8	25.3	24.6
Minas Gerais	16.9	25.4	24.8	26.1	26.1
Golas	5.1	11.3	9.2	7.8	7.8
Parana	.7	3.1	3.8	5.3	5.3
Santa Catarina	1.8	4.0	3.7	4.0	4.0
Maranahao	1.3	2.3	3.5	3.6	5.8
Rio de Janeiro	2.0	2.9	2.4	2.0	2.0
Others	5.2	8.6	9.6	9.9	11.0
Total	66.4	135.8	132.8	124.8	120.0

[1] Estimate of the Office of Foreign Agricultural Relations.
Compiled from official Brazilian sources, except as noted.

population is in the industrial area of the central States, most of the rice production there is consumed locally, with some imported from southern Brazil. Rio Grande do Sul is the only State producing an important surplus.

Rice exports from Brazil in 1949 will recede sharply from war- and postwar-year levels. Probable deliveries abroad in 1949 will be less than 100 million pounds. In comparison, about 200 million pounds were exported in 1945; 362 million in 1946; 531 million in 1947; and 475 million in 1948 (table 4).

TABLE 4.- *Brazil: Rice production and exports, average 1926-40, annual 1945-49*[1]

YEAR	ACREAGE	YIELD PER ACRE	PRODUCTION ROUGH	PRODUCTION IN TERMS OF MILLED	NET EXPORTS	PRODUCTION MINUS EXPORTS
	1,000 acres	*Bushels*	*1,000 bushels*	*Million pounds*	*Million pounds*	*Million pounds*
Average:						
1926-30.....	-	-	44,889	1,247	28	1,219
1931-35.....	2,074	28.4	58,970	1,725	110	1,615
1936-40.....	2,323	28.6	66,424	1,943	83	1,860
Annual:						
1945.....	3,702	28.4	105,182	3,077	195	2,882
1946.....	4,154	32.7	135,796	3,972	362	3,610
1947.....	4,166	31.9	132,779	3,884	531	3,353
1948.....	4,095	30.5	124,800	3,650	475	3,175
1949[2].....	4,152	28.9	120,000	3,510	-	-

[1] Rough rice of production and where occurring in trade is converted to terms of milled at 65 percent.

[2] Unofficial estimates.

Compiled from official statistics, except as noted.

The major reasons for the change in the rice export-supply picture in Brazil for 1949 are as follows: (1) Serious shortages of rice, which occurred in some regions of Brazil near the end of the 1948-49 (April-March) marketing season, resulted in the Government prohibition of exports until the country's domestic requirements were determined, the final production data established, and supplies reserved to meet domestic needs. No additional export permits are expected to be issued in 1949. (2) A prolonged dry spell in central and southern Brazil from mid-November to March, the main part of the growing season, caused an estimated decrease of about 5 million bushels in the total production. (3) Shortages of wheat, the most important food imported by Brazil, have caused consumers to substitute rice, resulting in an increased demand for rice in most consuming centers.

Brazil's export markets for rice have changed since prewar years. Average prewar exports (1936-40) in terms of milled rice averaged only 84 million pounds annually, of which 64 percent was delivered in the Western Hemisphere - mostly to nearby Latin America countries - 36 percent to Europe, and none to Asia or Africa. The most important single market was Argentina, where the product was exported as rough rice and milled in Argentine mills.

Since the war, Brazilian rice has been marketed on all the continents. According to preliminary statistics of exports by country of destination, nearly 70 percent of 1948 exports were delivered to Asia, 13 percent to Africa, 7 percent to Europe, and 10 percent to the Western Hemisphere. Within the Western Hemisphere, Brazil's markets shifted from Argentina to the British West Indies, Venezuela, and Cuba. (Table 5.)

In view of the prospects for an increase in the rice production of Asia and a shortage of foreign exchange in Asiatic countries, the markets in those countries that took Brazilian rice in 1947 and 1948 do not appear to be stable over a long period of time. This means that if Brazil's export supplies of rice approximate 1947 and 1948 levels in the near future, Western Hemisphere and European markets will be sought for such supplies. Thus an exportable supply of rice from Brazil in any year of the 1950-55 period above 200 million pounds is likely to have a more depressing effect on export markets for United States rice than twice that amount would have had in the 1945-48 period.

The per capita disappearance of rice in Brazil for the prewar period (1936-40) was about 40 pounds annually. During the war and postwar years, however, per capita consumption gradually increased, and it is expected to approximate 60 pounds during 1949. If consumption rates

TABLE 5.- *Brazil: Rice (milled) exports by country of destination, 1947 and 1948*[1]

CONTINENT AND COUNTRY	EXPORTS 1947	EXPORTS 1948
	Million pounds	*Million pounds*
Asia		
Ceylon	135	[2]60
India	75	136
Malayan Union	63	56
Netherlands Indies	-	43
China	10	-
Lebanon	23	-
Palestine	-	6
Syria	9	15
Transjordan	2	-
Total	317	316
Europe:		
Portugal	39	-
Belgium	31	15
Switzerland	26	1
Spain	7	-
Lithuania	6	-
United Kingdom	6	-
Czechoslovakia	4	2
Trieste	-	3
Italy	3	-
Bizone	-	5
Europe, Cont'd		
Holland	1	8
Total	123	34
Western Hemisphere:		
Br. West Indies	-	18
Venezuela	31	9
Bolivia	11	-
Fr. West Indies	11	9
Panama	6	-
Curacao	2	-
French Guiana	1	-
Cuba	-	7
Uruguay	-	1
Total	62	46
America:		
Reunion Islands	-	15
Fr. West Africa	35	19
Un. of So. Africa	9	14
Madagascar	-	11
Liberia	-	1
Total	44	60
Total Exports	546	456

[1] Preliminary.
[2] British Empire.
Compiled from information supplied by the American Consulate, Porto Alegre.

are maintained at this level, Brazil is not likely to have exportable rice surpluses as large as the volume exported from 1945 to 1948.

Milling and Marketing

For purposes of classification according to areas of rice production, Brazil may be divided into three major rice regions: (1) Northern Brazil, with the major States of Para, Maranhao, and Piaui: (2) Central Brazil, including the more important States of Sao Paulo, Parana, Goiaz, and Minas Gerais; and (3) Southern Brazil, which consists primarily of the State of Rio Grande do Sul.

Statistics by regions indicate that about 12 percent of the total rice area of the country is in northern Brazil, 75 percent in central Brazil, and 13 percent in southern Brazil. According to production statistics, however, only 10 percent of the volume of rice produced is harvested in the north, 65 percent in central Brazil, and 25 percent in the southern region. The average yield per acre harvested in the the large regions having dryland rice in northern and central Brazil is only about one-half the average yield per acre in the irrigated regions of Rio Grande do Sul. Thus the southern region produces a fourth of the total production on only about an eighth of the total area.

Most of Brazil's population is located in the central area, in or near the large cities of Rio de Janeiro and Sao Paulo and in the nearby large coffee-and-cotton plantation area. The northern region is usually about self-sufficient in rice production, with a small surplus in years of good weather. The central region is usually deficient in rice and requires additional rice supplies from other sections, although it produces 65 percent of the total. The southern region, Rio Grande do Sul, is the only rice area having an important surplus. Thus rice marketing in Brazil is characterized by the movement of large supplies from the southern area into the deficit central States. Trends in rice shipments from Rio Grande do Sul to other Brazilian States are presented in table 6.

In the prewar period (1936-40), Rio Grande do Sul shipped an average of about 270 million pounds of milled rice annually to other Brazilian States. In 1948, about 477 million pounds moved to these areas. Surpluses in Rio Grande do Sul were unusually large in 1948, due to carry-over stocks held at the beginning of the year, and this State was able to export an additional 392 million pounds to foreign markets. With a normal carry-over situation and increasing demands from other States, Rio Grande do Sul cannot be expected to have exportable supplies as large as in 1948.

Most of the rice produced in northern and central Brazil is the Agulha type, or "needle rice," and most of the southern area production is the short-grain Japanese type. The Agulha, that preferred by Brazilian consumers, is a long-grain variety similar to the Fortuna in the United States and has growth characteristics similar to the Honduras variety. It is not so long, nor does it have the flinty quality of the United States Rexora or Patna types, but it has a longer grain than any

TABLE 6.- *Rio Grande do Sul, Brazil: Rice shipments to other Brazilian States, 1948 with comparisons*

STATE	AVERAGE 1936-40	1944	1945	1946	1947	1948
	Million pounds	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*
Federal District.....	136	136	145	142	113	(
Rio de Janeiro.....	9	8	13	21	53	(280
Sao Paulo.....	84	5	2	0	0	[1] 53
Parana.....	12	6	8	1	0	(1) (2)
Bahia.....	7	8	13	21	16	17
Pernambuco.....	9	10	17	21	17	[1] 22
Others.....	13	11	18	30	36	[1] 45
Total shipments...	270	184	216	236	235	477
Foreign exports.....	71	298	160	309	214	392
Shipments and exports	341	482	376	545	449	869

[1] Does not include approximately 60 million pounds shipped to Sao Paulo and Parana by rail.
[2] Not separately reported.
Rio Grande do Sul Rice Institute.

of the United States medium-grain varieties. Blue Rose, a medium-grain variety introduced from the United States in 1929, is the second preference of Brazilian consumers. Blue Rose production has been declining since 1935 and now represents only a small part of the total crop. In Rio Grande do Sul and the limited irrigated areas of other States, the most important variety is "Japonez." This term is used to describe all Brazilian short-grain rice and dates back to 1918 when Japanese varieties were introduced into southern Brazil. Although not preferred by Brazilian consumers, these short-grain types are cultivated because they produce higher yields than other varieties.

At the present time, about 70 percent of Brazil's production is the Agulha long-grain type; about 5 percent, the Blue Rose medium-grain; and 25 percent, the Japanese short-grain rice. In northern and central Brazil, about 95 percent of the total production is Agulha, 3 percent Blue Rose, and 2 percent the short-grain Japanese type. In Rio Grande do Sul, however, about 85 percent of the rice harvested is of the Japanese short-grain type, about 10 percent is Blue Rose, and only 5 percent is Agulha. Before the war (1935-39), Rio Grande do Sul produced about 60 percent short-grain, 35 percent medium-grain, and 5 percent long-grain rice. Apparently due to high prices and reduction of quality differentials during the war, many farmers in the exporting State of Rio Grande do Sul shifted to the production of short-grain rice. This type is not only better adapted to the short growing season, but it produces a higher yield per acre.

In central and northern Brazil, much of the harvest never reaches commercial mills. It is consumed for the most part on the farms or in the local producing areas, and it is either hand-pounded on the farm,

hulled in small hand-operated "coffee-grinder" rice mills that are manufactured in Brazil, or taken to a small local mill and processed on a toll basis. Thus there are few large commercial rice mills in central and northern Brazil.

In southern Brazil, however, the rice milling industry is well-organized and efficient. There are 50 fairly large rice mills in the State of Rio Grande do Sul, located mainly in or near Porto Alegre. These mills operate old-type, German-made machinery, which efficiently mills the Japanese-type short-grain product of the region. Some of these mills are equipped to apply talc and glucose coatings, and they produce a glazed rice of the short-grain type that is equal in quality to that observed anywhere in the world. Average milling percentages for Japanese short-grain rice are 52 percent head rice, 10 percent first heads, 4 percent second heads, and 3 percent brewer's rice, or a total yield of 69 percent. An additional 8-percent yield of rice bran is obtained, and the remaining 23 percent consists of hulls and waste, which are used as fuel in operating the steam-generating power systems of the mills. Typical Blue Rose percentages were reported to be 46 percent head rice, 16 percent first heads, 4 percent second heads, and 2 percent brewer rice, or a total yield of 68 percent. Milling percentages for Agulha long-grain rice were reported to be 38 percent head rice, 10 percent first heads, 10 percent second heads, and 2 percent brewers rice, or a total yield of only 60 percent.

Rice grading regulations of the Government, established in 1941, provide for nine different grades. In general usage, however, the trade has grouped these different grades into four general commercial grades. The detailed Government grade requirements and the trade grouping are as follows (table 7).

TABLE 7.- *Rio Grande do Sul, Brazil: Rice grades in 1949*

TRADE AND GOVERNMENT GRADES[1]	BLUE ROSE AND JAPAN TYPES				AGULHA TYPE
	PERCENT STRIPED GRAINS	PERCENT CHALKY	PERCENT BROKEN	PERCENT WITH YELLOW	PERCENT BROKEN
Special:					
Type 1.....	0.5	2.0	5.0	-	10.0
Type 2.....	1.5	2.0	10.0	-	15.0
Type 3.....	2.5	2.0	15.0	0.03	20.0
1-A:					
Type 4.....	5.0	2.0	20.0	.06	30.0
Type 5.....	7.5	3.0	30.0	.1	40.0
2-A:					
Type 6.....	10.0	4.0	40.0	1.0	50.0
Type 7.....	25.0	5.0	50.0	3.0	60.0
Type 8.....	50.0	5.0	60.0	5.0	60.0
3-A:					
Type 9.....	50.1 +	5.1 +	60.1 +	5.1 +	60.0 +

[1] The usual trade grades are the general groupings including Special, 1-A, 2-A, and 3-A, with the maximum tolerance for each factor being the highest for any in the group. The "type" groupings are the new government grades.

Rio Grande do Sul Rice Institute.

FIGURE 7. Harrowing land that has been flooded prior to seeding rice in British Guiana.

Production Methods

For Brazil as a whole, in 1948-49 about 80 percent of the total rice area was planted to dryland or upland rice, and only 20 percent was of an irrigated crop similar to that in the United States. Brazil produces more than 3 million acres of upland rice annually and is the largest producer of this type in the world. The high proportion of rice produced without irrigation is the major reason for the wide yearly variation in the total crop of Brazil. When rainfall is adequate, good yields are obtained, otherwise severe shortages result.

Upland rice is grown mainly in the central and northern parts of the country, and about 90 percent of the rice area there is nonirrigated. In the commercial section, Rio Grande do Sul, only 10 percent of the area is in upland rice, and 90 percent of the rice is of the irrigated type.

The dryland upland rice of central and northern Brazil is produced mostly on rolling-to-hilly land, under relatively primitive conditions (fig. 5). Irrigation is not practiced, and hand methods of cultivation are used. Rice is a major food crop on many small farms and a supplementary food crop for laborers on large farms.

Most of the dryland rice in Brazil is produced with the use of only one piece of farm equipment, the hand hoe (fig. 6). The production pattern is as follows: (1) Trees and brush from virgin land are cut, piled, and burned during the latter part of the dry season, which in most areas extends from May to August. (2) When the first general rains begin in September and October, the freshly burned-over land is hoed, shallow holes in the soft earth are dug, rice seeds are dropped at a uniform rate of seven per hill about 10 inches apart, and sod is pushed over the hill with the feet. (3) The growing rice is hoed two to three times and all weeds are chopped out during the growing season, which is from November to March. (4) The crop is cut by hand (fig. 17) in the harvest season from February through March. The harvested rice is then tied in small bundles and hung on small racks to dry. (5) These small bundles of cut grain are transported after 1 to 3 weeks to a central location, usually not more than 200 yards distant by hand or by oxcart. The crop is then threshed by beating the bundles over a slatted-rack platform, which is encircled with a 4- to 5-foot canvas wall to prevent the grain from scattering. The usual crew for a harvesting operation of this type includes two workers to cut, one to haul (with an oxcart), and two to thresh. The rough rice is produced on many small farms under these conditions and is usually stored at the farm. In many cases, especially in the Amazon region in the North, this rough rice is stored in the rafters where the heat and smoke from the fire keep it dry. Since the crop deteriorates less as rough rice than as milled, the practice is to take small quantities of rough rice to small mills nearby where it is milled on a toll basis as needed for home use. Small surpluses are sold to local buyers who accumulate large volumes and sell them to mills (fig. 23) or to larger concerns. A farm family usually produces no more than 10 acres of rice annually.

The volume of Brazil's future rice exports appears to depend to some extent on the permanency of dryland rice production. If this pro-

duction should continue to increase, rice would not be required from Rio Grande do Sul and Brazil's export supplies will rise. If dryland production in central Brazil, on the other hand, does not continue to advance in proportion to the gain in population, that area will require larger imports from Rio Grande do Sul's commercial crop, and exportable supplies for foreign countries will decline. According to most authorities in Brazil and in the American Embassy, the expansion of dryland rice production in recent years has been the result of relatively high prices. Rice has been a more profitable crop than cotton, replacing it as a cash crop on many farms. Additional lands are being cleared for cotton and coffee, on which dryland rice is usually the first crop planted. Upland rice production, therefore, is not expected to be as great in the next 5 years as in the past 5-year period.

In contrast to most of the remainder of Brazil the rice production enterprise in the State of Rio Grande do Sul is semimechanized, and most of the rice is irrigated. It is cultivated on a fairly large, level area, and efficient production and marketing methods are followed. Long-time rotations tend to stabilize yields per acre and total production from year to year. The area looks like much of the rice farming land in the United States.

The farming operation, however, is not mechanized as we, in the United States, think of mechanization. The land plowed with tractors comprises less than 10 percent of the total area planted. Most of the land is plowed in the fall and winter (May to July) with oxen teams drawing 8- to 12-inch, steel mould-board plows. While some fields are plowed with tractors, most of the farmers report they prefer to use the more expensive equipment only when a rush job, such as fitting and harvesting, is to be done. Tractors are more widely used for fitting operations in the spring months of September and October. About 60 percent of the total area is disked with tractors. The practice is to disk once or twice and then broadcast the seed with end-gate seeders. Seeding is at the rate of about 200 pounds per acre, or about twice the rate used in the United States, and about four times that in the dryland areas of Brazil, where the rice is dropped in hills by hand.

Rice is planted in October and November. After seeding, the levees are built by hand, with shovels. Tractor graders were introduced several years ago, but they are little used. When the plants are from 4 to 6 inches high, the fields are irrigated. Of the total area planted, 56 percent is irrigated by pumping water from nearby streams, mostly with steam-engine operated pumps, which burn wood for fuel. About 31 percent of the planted area is irrigated by reservoirs and gravity-flow systems and 13 percent by a combination of these two methods. Water usually is maintained on the land until about 3 weeks before harvesting.

Harvesting in Rio Grande do Sul is begun early in April and completed in May. Rice is cut mostly by hand scythes. Combines were introduced in 1939, but the area cut mechanically is still less than 1 percent of the total area harvested. After having cut the standing grain with scythes, the general practice is to tie the stalks into small bundles and stack them in shocks about 5 feet high. Two to three weeks after

shocking, the cut grain is hauled to stationary threshing machines (fig. 18). These machines are modern types, imported mostly from the United States. Except for the use of oxen for hauling, this threshing practice is similar to that in southern United States before combines were used. The straw stacks are used for cattle feed in the winter. Because of the damp harvesting season, most of the rough rice is dried in artificial dryers even though it has been shocked in the field. These dryers are of the upright type, similar to those used in the United States and in Italy, and are an essential item of equipment on all fairly large farms. Many of the smaller producers dry their rice on open-air wooden platforms.

Forty-four percent of the rice land was operated by owner-operator farmers and 56 percent by tenants in 1948. Tenants usually pay cash for rent, amounting to about 20 to 25 percent of the crop, and supply their own irrigation facilities. Rental includes the fallow land used for their livestock. There are about 6,500 rice farms in the State. Of these, 50 percent cultivate less than 15 acres of rice per farm and the remainder, being fairly large farms, produce as high as 500 acres of rice. A rotation of rice for 1 year and fallow land, pastured with beef cattle for 2 years, is generally practiced. There are about 850 tractors on rice farms in the State (more than one-third of all the tractors on farms in Brazil), most of which are medium-sized steel-wheel type from the United States. There are about 1,600 mechanical irrigation pumps, mostly steam-operated. About 40 percent of the producers use fertilizers. From 90 to 180 pounds of bone meal is applied per acre of rice planted.

Costs of production at the producer level are reported to be advancing. According to the annual survey of costs conducted by the Institute do Arroz (The Rice Institute), average costs of rice production have increased from $70 per acre in the 1945-46 season to $93 per acre in 1948-49. Average reported yields per acre are about 57 bushels of rough rice. Labor and machinery costs are not expected to decline. Current labor costs on farms are from $1.34 to $1.60 per 8-hour day, or about double the rate of 4 years ago. The tractors most commonly used cost from $4,270 to $5,600. Gasoline costs farmers 39 cents per gallon; kerosene or tractor distillate, 29 cents per gallon; diesel fuel, 26 cents per gallon; and motor oil, 76 cents per gallon. Tractors, trucks, and all types of machinery parts have become scarce and the price has risen in recent months. This is caused by Brazil's dollar shortage and the resulting restrictions on imports.

Average man-labor requirements for producing rice in the Rio Grande do Sul area are as follows:

	HOURS PER ACRE
Plowing with oxen teams	14.4
Preparing ditches and levees by hand	24.0
Disking, fertilizing, and planting with tractor	12.0
Irrigating the growing crop	28.8
Cutting and shocking by hand	36.0
Threshing with stationary thresher	9.6
Hauling to dryer and drying	4.8
Hauling to mill	2.4
Repairing machinery and equipment	28.8
Maintaining fences and roads	9.6
Supervision	14.4
Total	184.8

These requirements are based on an average yield of about 70 bushels of short-grain rice per acre or a man-labor requirement of about 2.5 hours per bushel. United States average labor requirements are about 30 hours per acre or less than 0.5 hour per bushel of harvested rough rice.

Outlook

Exports of rice from Brazil are not expected to exceed an average of 200 million pounds annually for the next 5 years. With the exception of the crop in the Rio Grande do Sul region, rice production has been gaining only fast enough to meet domestic demands. Indications are that the increase in output may be less than the gain in consumption, thus a larger part of the export surplus from Rio Grande do Sul may be needed in central and northern Brazil, reducing supplies for export.

An important factor to remember when considering future production is that this crop was increased during the war primarily as the result of high world prices for rice. Cultivation is not likely to increase further in central and northern Brazil, because production costs on the predominatly small farms are not easily reduced to meet the drop in world rice prices. The Rio Grande do Sul area, however, is one of large farms with good land. Some long-time increase in production is possible in this area, although declining prices plus land-and-water limitations are likely to retard any large-scale expansion. Indications are that much of the increase in supplies available from Rio Grande do Sul may be absorbed by the demands from other areas in Brazil.

Although there appears to be little probability that Rio Grande do Sul will expand rice production substantially in the next few years, the current acreage level, between 500,000 and 600,000 acres, probably will be maintained for the next 3 to 5 years. Current plans of the State are for the construction of additional irrigation facilities to increase production by as much as 25 to 50 percent. Some of these plans will be completed, but others are likely to be abandoned because of the high construction costs in relation to export prices for rice.

The Rio Grande do Sul area will continue to produce rice that will compete to some extent with United States rice in export markets. This competition will be restricted to short-grain rice. For the next 3 to 5 years indications are, because of larger demands for rice in central Brazil, the volume available for export from the region will be less than the 362 to 531 million pounds exported annually from 1946 through 1948.

Ecuador

Ecuador will continue to be an important exporter of rice and will compete strongly with the United States for markets in Latin America. Trade from Ecuador during the next 3 to 5 years probably will be between 100 and 150 million pounds annually, varying somewhat with weather conditions. The coastal rice region of Ecuador is a relatively productive area. The climate is ideal in many respects for rice growing, and there is sufficient land to permit an increase in production and

export levels. Any large expansion of Ecuador's rice output, however, is not expected to occur in the near future. Current production levels appear to be utilizing fully the present labor resources and, because of certain geographic and climatic disadvantages, mechanization will develop slowly. Thus, the indications are that Ecuador, following some price and wage-rate adjustments, will continue to produce about the same quantity of rice.

Ecuadoran rice is of the long-grain type and is of fairly good quality. Although some exporters feel that they should develop nearby markets to decrease shipping costs, their present policy is to sell to those areas offering dollar exchange in payment. Their most important markets in recent years have been the Philippine Islands, Cuba, and Venezuela. They hope that their primary markets of the future will be Cuba and Venezuela, since these countries want long-grain rice and have the dollar exchange to pay for it. They also hope to continue marketing some rice in the Philippines because of the availability of dollar exchange in that country. For the next 3 to 5 years, United States producers of long-grain rice can expect some competition from Ecuador in Cuba, Venezuela, the Philippine Republic, and possibly Europe.

Production, Consumption, and Trade

Ecuador's production more than doubled between 1941 and 1948 and total exports increased about three times (table 8). This expansion appears to have begun during the depression in 1930 to 1934, when production costs dropped more than selling prices. At about the same time,

TABLE 8.- *Ecuador: Rice production, exports, and domestic disappearance, 1940-49*

YEAR	PRODUCTION		EXPORTS	DOMESTIC DISAPPEARANCE[1]
	ROUGH	IN TERMS OF MILLED		
	1,000 bushels	*Million pounds*	*Million pounds*	*Million pounds*
1940.....	3,026	89	40	49
1941.....	4,265	125	45	80
1942.....	5,718	167	71	96
1943.....	7,607	223	104	119
1944.....	6,075	178	142	36
1945.....	4,577	134	65	69
1946.....	7,691	225	148	77
1947.....	8,494	248	139	109
1948.....	6,596	193	139	54
1949[2].....	8,700	254	-	-

[1] Not adjusted for differences in carry-over from year to year as inventory data for most years are not available. The annual consumption for the country as a whole from 1945 to 1948 is estimated to be from 75 to 100 million pounds of milled rice.

[2] Preliminary.

Compiled from official statistics.

plant diseases started a downward trend in Ecuador's important cacao crop and farmers turned more and more to rice cultivation. By 1945 the income from rice exports was greater than that from any other agricultural product and was exceeded only by that derived from the manufacture of "Panama" hats. Since 1945, rice has been the most important source of foreign exchange for Ecuador and has comprised more than one-third of the total earned from all sources.

Annual surveys or official estimates showing Ecuador's rice acreage are not available. According to the most reliable estimates, it appears that there were about 90,000 acres harvested from 1940 to 1942 and about 150,000 acres in the next 3 years. From 1945 to 1949 the acreage increased to a relatively stable level of about 180,000 acres. The current estimates of the 1949 rice acreage, including both crops, is about 180,000 acres. The large harvest in 1949 is the result of relatively favorable weather, in marked contrast to the below-average climatic conditions that prevailed in 1948. The production and estimated acreage figures give an average yield per acre of 48 bushels, or about 12½ barrels, in 1949, compared with 37 bushels, or about 10 barrels, in 1948.

Trade sources estimate that export supplies in 1949 will amount to approximately 150 million pounds of milled rice. If the production is as large as expected, these export supplies will exceed the previous record exports of 1946 (table 9).

Ecuador's prewar rice exports, averaging about 25 million pounds annually, were shipped mostly to Venezuela, Peru, Colombia, Panama, and Cuba. Peru, Colombia and Panama are not likely to become importers of rice again. Ecuador now has about six times as much rice to sell with fewer available markets than in the prewar period. The pressure of these export supplies is likely to have a depressing effect on United States rice markets in Latin America.

TABLE 9.- *Ecuador: Rice (milled) exports by country of destination calendar years 1946-48*

COUNTRY	1946	1947	1948
	1,000 pounds	*1,000 pounds*	*1,000 pounds*
Philippines	38,126	0	45,260
Cuba	45,517	11,573	25,037
Indonesia	4,367	0	15,170
Venezuela	17,413	49,380	11,952
Peru	0	0	9,582
Panama	4,931	3,571	6,743
Dominican Republic	0	4,525	4,574
Colombia	2,011	12,529	2,494
French West Indies	4,195	0	0
Greece	5,283	993	144
Jamaica	16,253	7,238	0
Mexico	5,528	2,034	0
India	0	38,092	0
Others	3,904	8,912	17,897
Total	147,528	138,847	138,853

Compiled from official sources.

The normal domestic disappearance of rice in recent years for the country as a whole has been estimated at about 85 million pounds of milled rice annually. This results in a computed per capita consumption rate of about 25 pounds a year. Per capita consumption reportedly is much higher in the coastal provinces than in the mountain areas.

Milling and Marketing

Three principal types of rice are produced in Ecuador. The most important is "Canilla," a medium-long, slender grain which is accepted in most of the export markets as a long-grain rice although it is slightly smaller than most of the long-grain varieties. This type comprises about 65 percent of the total and is produced primarily for export. It predominates because it yields a higher volume of milled rice under local production methods and mills into a white, clean product with a relatively low percentage of broken grains. Canilla has one disadvantage, however, in that it lodges more than any other variety. With hand-harvesting as practiced in Ecuador this does not present a serious problem. Because of lodging, however, this type is not adapted to mechanized production. Millers report that, as the result of the small size of "Canilla" grains, the milling capacity is reduced from 10 to 20 percent in comparison with other types.

The second type, "Fortuna," accounts for about 30 percent of the total crop. This rice is preferred for domestic consumption and brings a slight premium on local markets. The grain is as long as Canilla but is about twice as wide. The third type is a combination of several medium grains, the most important of which is "Chato" which looks something like the Prolific variety.

Reference is made to types rather than varieties, since there appear to be few if any pure-line rice varieties in Ecuador. The Canilla is reported to have originated from the Rexora variety. Although it has growing-season requirements similar to Rexora, it is slightly smaller, has a deeper orange color, and looks like some of the "fine" rices of India. The grains are not uniform in size or shape. The Fortuna is named after the seed obtained originally from the United States, but it, too, has been well mixed with other types, including some of the Siam varieties and Nira and Lady Wright from the United States. It, therefore, shows a wide variation in size of grain. The medium-grain types apparently came from Argentina, Brazil, and the United States, and several varieties usually can be identified in any given lot.

The producer purchases rough rice on the basis of 100 pounds of milled, and all statistics regarding rice are in terms of its equivalent in milled rice. Government regulations provide that the mills pay for the Fortuna or Chato types on the basis of 175 pounds of rough rice per 100-pound, milled rice credit. The Canilla type is sold on the "dry and clean" basis of 165 pounds of rough rice per 100-pound milled rice credit, and the miller is permitted to require up to 190 pounds of rough rice per 100-pound milled rice credit, if the rough rice has impurities or a high moisture content. Since determinations of these factors are visual

and are only approximate, the miller requires delivery of a little more rough rice than will be needed to obtain 100 pounds of milled in order to be on the safe side. This "over run" usually is reported to average about 10 percent.

When the miller has dried the rice (fig. 29) sufficiently for reasonably good storage, he reports the quantity and type received to the control authorities of the Government. These reports are required at 15-day intervals during the season and are audited by Government inspectors. After the rough rice is stored (fig. 30), the miller either sells it to the Government at the support price or mills it. Because of the uncertainty of export prices in 1949, the rough rice usually has been sold to the Government. Although it is sold immediately, it remains in the millers' warehouses. Millers are required to keep it in reasonably good condition for 3 months free of charge and are paid a small storage fee thereafter. The rough rice is milled only by Government order when it has been sold to an exporter or domestic dealer.

Another unusual marketing feature in Ecuador is the type of storage. Practically all rice is stored as bulk rough rice in flat warehouses. These are large, two- to four-story bamboo structures with open sections for ventilation near the top of the wall on each floor. Storage is arranged according to variety and impurities, and rice is dried on open-air, concrete drying floors. It is dumped on the floors, spread out evenly, and stirred by walking over it barefoot. Each night it is piled and covered with canvas to prevent dampening from dew. This process is repeated daily for about a week. When sufficiently dry to store, it is sacked, hauled into the low, flat warehouses, and dumped on the floor. Government regulations require that rough rice cannot be stored in warehouses at a depth of more than 59 inches, except under unusual circumstances, when a depth of 79 inches is allowed. For about a month after it is stored in the warehouses, the rough rice is turned daily by workers who use hand shovels, starting at one end of the warehouse and working toward the other end. After the first month, occasional turnings at less frequent intervals are required until the rice is milled.

There were two mechanical dryers in Ecuador, and these were used for only part of the rough rice delivered at the two mills that operate them. One miller using moisture-testing equipment reported that the rough rice usually contains from 25 to 28 percent moisture at the beginning of the season, but by the end of the season, the moisture content drops to about 18 percent. The open-air drying method used by most mills is possible because of the low rainfall in late June and July. Under this method, however, "stack-burning" and discoloration are likely to occur after about 3 months.

Some millers follow the practice of heating the rough rice by stacking it to a great depth and leaving it unturned in order to produce stack-burn and discoloration. The milled result is a "yellow" rice, which has a ready sale in some areas. This relatively low-quality rice appears to have been sold in the interior mountain areas where consumers have developed a preference for it.

Reliable data on percentages of products milled from rough rice were difficult to obtain. Although much variation was reported from

TABLE 10.- *Ecuador: Percentage of rice products obtained per unit of fairly clean rough rice with 15 percent moisture content*

PRODUCT	CANILLA	FORTUNA
	Percent	*Percent*
Whole milled rice[1]	64.52	66.67
Broken rice	1.94	1.34
Rice polish	3.87	2.66
Rice bran	7.74	7.33
Hulls and waste	21.93	22.00
	100.00	100.00

[1] Includes an average of from 15 to 20 percent broken grains.

mill to mill, the above data appear to represent the percentage yield under ordinary milling conditions.

Whole grains generally are not separated from the brokens and remixed according to definite specifications. Only the very fine brokens are separated and sacked, and the remainder is marketed as one product, "whole milled rice." To produce milled rice with broken percentages, rice is selected that will produce the desired product without separation.

Sixty-eight "public" mills and forty-four "private" mills reportedly are in operation in Ecuador during the current milling season. Public mills are licensed to mill for their own account and for the public, are permitted to issue warehouse receipts for all rice received, and are subject to Government control. Private mills are small units, operated by some large producers to process their own product.

Government-owned rice represents about 80 percent of the current crop, the millers are allowed certain fixed fees for toll-milling it and they maintain control of the byproducts. By Government regulation, there are three principal grades of milled rice: No. 1, a white rice with no more than 3 percent stained and up to 25 percent broken grains; No. 2, a cream-colored product, with not more than 8 percent stained and up to 30 percent broken grains; and No. 3, a yellow (stack-burned) rice with up to 30 percent broken grains. The toll-milling fee allowed for producing any of these for domestic consumption is about 60 cents per 100 pounds of milled rice.

The toll-milling fees are higher for the milling of better-quality rice for export. The export quality rice is all of the No. 1 grade, divided into four classes. For class 1, which has a broken tolerance of 10 percent or less, the toll-milling fee is equivalent to $1.14 per 100 pounds of milled rice. For class 2, with a broken tolerance of from 10 to 14 percent, the fee is $1.07. For class 3, with a broken tolerance of from 15 to 20 percent, the fee is 92 cents; and for class 4, with a broken tolerance of from 21 to 25 percent, the fee is 77 cents per 100 pounds. Exporters report that most of the sales in recent years have been of class 3 quality. Since the milling fees range from 75 cents per 100 pounds for class 4 to $1.14 per 100 pounds for class 1, they are all higher than the milling fee for rice consumed domestically. Ac-

cordingly, most of the millers prefer to mill rice for export. Once the rice stored in their warehouses is sold to the Government, however, they must mill it according to Government regulations. For this reason, some of the millers finance their own rice for export rather than chance a lower milling-toll for rice consumed domestically.

Exports of rice from Ecuador are handled by the private trade subject to certain Government controls. The Government fixes the price that the exporter must pay for the rice, controls the volume of exports by requiring an export license, and assesses certain taxes. The usual costs of exporting 100 pounds of the standard No. 3 grade of Canilla milled rice, with from 15 to 20 percent broken grains, in Ecuador in mid-1949 were as follows:

Controlled price for 160 pounds of rough rice.....	$5.97
Milling toll	.90
Sacks.....	.37
Sacking	.02
Insurance.....	.04
Transporting and loading from mill to ship.....	.09
General taxes local and federal taxes on milled rice..	.33
Special f.o.b. taxes on exported rice.....	.40
Total cost loaded on ship in the harbor.....	$8.12

With such a cost structure, exporters in Guayaquil reported that they must obtain a f.o.b. price of at least $8.25 per 100 pounds to justify the operation. In mid-1949 they experienced difficulty in obtaining such a price, and little rice was being exported.

Prices

The Government-guaranteed price for rough rice of the 1949 crop was about $1.80 per bushel, or $6.00 per barrel, for "standard" quality rough rice delivered to country mills and $1.90 per bushel, or $6.36 per barrel, delivered to city mills at Guayaquil. Under this price schedule, it is expected that the Government should own about 80 percent of the 1949 crop at the end of the harvest season. Rough rice was usually separated into two grades, "standard" and "below standard," based on the milling yields, impurities, and moisture content as judged by visual observation on delivery. The fixed price for "below standard" rough rice was about 10 percent less than that for the standard grade.

The wholesale price, in bulk at the mill, for rice of export quality varied from $6.12 per 100 pounds for the No. 4 export grade, with from 21 to 25 percent broken grains, to $6.50 for the No. 3 grade, $6.86 for the No. 2, and $7.24 for No. 1 grade. The equivalent f.o.b. price, after sacking, transporting, and paying all taxes varied from $7.38 per 100 pounds for grade No. 4 to $7.75 for No. 3, $8.12 for No. 2, and $8.50 for No. 1.

For the domestic trade the wholesale price of rice of the "common" grade was fixed at about $6.00 per 100 pounds and that of the "extra" grade was listed at $6.35 per 100 pounds. The fixed retail price for these grades varied from 6.3 to 7.1 cents per pound.

Production Methods

Most of Ecuador's rice is produced on small, tenant-operated farms, with an average planted area estimated at about 7 acres. These farms are financed by the mills or land-owners. Most of the loans may be paid by the delivery of a given amount of rice to the lender during the harvest season. The grower delivers small lots of rice to the mills, where it is graded and sorted according to variety, moisture content, and impurities. He is credited with deliveries until all his loans have been paid, and he is then issued certificates for the remainder of the crop, which he can sell to the highest bidder. Grading is done mostly by hand sampling and visual observation.

There are two major and one minor rice crops harvested in Ecuador annually. The most important, the "invierno," or winter crop, is seeded late in December and January at the beginning of the rainy season and harvested late in May and through June and early July, immediately after the end of the rainy season. This crop makes up about 80 percent of the total annual production. In August the minor crop, the "soca," which makes up about 5 percent of the total production, is harvested. This crop grows entirely from the offshoots from the May-July harvest stubble. The second most important is the "vega," or summer crop, which is planted in June and harvested in late September and October and comprises some 15 percent of the total.

Short-grain varieties from Italy and the United States have been tried from time to time and producers report they obtain unusually high yields, but the price is so low in relation to prices for Canilla and Fortuna that this short-grain rice is not profitable.

The principal crop is planted on land that has been idle for 1 or 2 years, having weeds and brush from 6 to 10 feet high. The hand-knife, or machete, is the only implement used by most of the farmers when growing and harvesting the crop. Near the end of the dry season before the December planting, the vegetation is cut with the machete and burned. When the rains begin, small holes are dug about 10 to 12 inches apart in the burned-over soil, and three to four rice seeds are dropped in each hole. Thus the fields are prepared and planted. Although most of the land has no terraces, drains, or means of artificial irrigation, the fairly flat fields between low-lying hills or higher sloping land act as natural water reservoirs, which collect and hold the water until the end of the rainy season. An average of three hand-weedings a year, about a month apart, is usual, and the weeds are cut down with a machete.

The planting is timed so that the crop receives the full benefit of the rainfall during the rainy season. Average rainfall records for the rice area of Ecuador are shown in table 11.

In harvesting, a small area is cut with a machete or hand-scythe, a sheet of canvas is often spread on the stubble field nearby, where the rice is threshed (fig. 19). A small bundle of the cut stalks is picked up and the heads are beaten onto the canvas. It usually takes only one stroke to shatter out all of the grain of the Canilla variety from a bundle of 20 to 40 stalks. After threshing, the grain is raked up,

TABLE 11.- *Ecuador: Average coastal rainfall for 25 years*

MONTH	VOLUME	MONTH	VOLUME	MONTH	VOLUME
	Inches		*Inches*		*Inches*
January	15.20	May	3.47	September	0.11
February	19.73	June	.57	October	.28
March	18.13	July	.01	November	.27
April	11.58	August	.03	December	2.38

sacked, and carried by hand or donkey to a nearby stream where it is placed on the bank to await a buyer. Because the heavy rainy season usually washes out the roads, most transportation at harvesttime is by water. Rice buyers who are representatives of different mills move up and down the streams, bargain for the crop, and furnish the sacks in which the rough rice is transferred to the boats. It is then transported to the mills to be dried and processed.

While some mechanization is in progress, the mechanized production under controlled irrigation does not make up more than 1 to 2 percent of the total area planted to rice. Rice is not grown on one uniform, flat stretch of land. Rather, it is grown on a large number of fairly small, widely separated and somewhat rolling, fertile lowland areas, with rugged hills and many streams in between. During the rainy season, it is often impossible to move a tractor from one field to another and transportation other than by water is impossible. The fields, although fairly level, are not suitable for terracing and artificial irrigation without extensive improvements. As weeds present a major production problem, it is hoped to eliminate hand weeding by irrigation and planting in water. Some harvesting with the use of combines is also planned. Rather complete mechanization can and may take place over a 20- to 30-year period.

Outlook

Ecuador's annual volume of rice exports in recent years has been from five to six times the prewar level. With a decline in the income from cacao and certain other tropical products, rice has become the most important source of foreign exchange. Some interests in Ecuador confidently hope that Ecuador's rice exports will be expanded beyond the present postwar peak and that they will be able to obtain a large share of the rice markets in Venezuela, Cuba, and Europe. They produce long-grain rice and have reasonably efficient milling facilities. Production is mostly on a hand-labor basis without formal irrigation, but they hope to mechanize the rice industry in the near future to increase the volume produced and reduce costs.

Ecuador will continue to be an important exporter of rice but probably will not expand production substantially beyond current levels. Production expanded greatly during the war because of unusually high prices for rice and unlimited markets. Recent trends in the world rice

market indicate that supplies are increasing, prices have declined, and many countries, including Ecuador, are experiencing difficulty in exporting rice even at much lower prices than a year earlier. In addition, Ecuador has several basic physical factors that will make it difficult to mechanize its rice industry immediately, including rainfall distribution, an unfavorable topography, and the lack of varieties adapted to mechanization that will produce a good yield per acre. Also, the average quality of Ecuadoran rice is not such that it will compete with high-quality, long-grain rice from Siam or the United States, and the substitution of new varieties is not likely to solve this quality problem. Ecuador's difficulty in producing high-quality, long-grain rice is the result of climatic factors during the harvest season and drying and transportation problems.

United States producers can expect increasing competition from Ecuador, since its recent markets in Asia are likely to be reduced. They can best meet this competition by maintaining high-quality standards in all exports.

British Guiana

British Guiana exported rice before the war and it can be expected to be an important factor in world rice trade in the future. This Colony exported an average of about 34 million pounds of milled rice annually during the 1936-40 period, increased exports to a peak of almost 58 million pounds in 1945, and maintained trade at from 40 to 50 million pounds in the years 1946 to 1948 (table 13). In the next 5 years, export supplies probably will range between 50 and 60 million pounds annually, and may be greater.

British Guiana's export supplies are shipped primarily to nearby British West Indies. In the prewar period the United States marketed some rice in that Caribbean area. Because of the probable future increase in supplies of British Guiana, markets for United States rice in the British West Indies will be difficult to re-establish and maintain as in the prewar period.

Most of the rice produced in British Guiana is of the medium-grain varieties, and because of large infestations of red rice it is of medium quality. Practically all of it is parboiled before milling to meet a consumer demand in the Colony and the British West Indies. Because of the type produced and the method of processing in British Guiana, the price is not likely to compete with the high-quality, long-grain rice from the United States in our more important export markets of Latin America. This product, however, will offer increasing competition with United States medium-grain rice in the British West Indies and possibly other Latin American outlets.

Production, Consumption, and Trade

Rice production in British Guiana has increased about 40 percent in comparison with prewar levels. The total acreage expanded from an annual

TABLE 12.- *British Guiana: Rice acreage and production, average, 1935-36/39-40, annual, 1941-42 to 1948-49*

YEAR (OCTOBER-SEPTEMBER)	AREA HARVESTED	PRODUCTION		YIELD PER ACRE
		ROUGH RICE	IN TERMS OF MILLED	
	1,000 acres	*1,000 bushels*	*1,000 pounds*	*Bushels*
1935-36/39-40	70	3,559	104,101	50.8
1941-42	94	4,320	126,360	46.0
1942-43	94	4,127	120,715	43.9
1943-44	75	4,551	133,117	60.7
1944-45	90	4,708	137,709	52.3
1945-46	94	5,034	147,244	53.6
1946-47	97	4,993	146,045	50.9
1947-48[1]	107	4,760	139,230	44.5
1948-49[1]	95	4,976	145,548	52.4

[1] Preliminary.
Office of Foreign Agricultural Relations.

average of 70,000 acres for the prewar period to a peak of more than 106,000 acres in 1947-48 and the 1948-49 estimate is 95,000 acres (table 12). Total production expanded from an annual average of about 3.6 million bushels of rough rice in the prewar period to approximately 5 million bushels a year in 1948-49. Yields per acre have varied somewhat from year to year, but they show no consistent trend away from the long-time average of 50 bushels per acre, thus the gain in production has been due entirely to an increase in acreage.

In the prewar period, about 64 percent of the rice production of British Guiana was used domestically - about 52 percent as food and 12 percent for feed and seed - and 36 percent was exported. Although the population has increased, rice production has also gained so that the relative proportion of the total crop for each use was about the same in the 1945-47 period.

British Guiana is one of the largest consumers of rice per capita in the Western Hemisphere. The per capita disappearance now is about 180 pounds annually, compared with 150 pounds or more throughout thewar period. The country has a population of 376,000 people, mostly of East Indian or African descent. Only about 5 percent are of European origin. Rice is the major food, representing more than 50 percent of the total calory intake.

Marketing and Milling

Rice marketing is controlled by the Rice Marketing Board, an Agency of the Colonial Government. Milled rice for export is classed in eight grades of milled parboiled and three grades of milled raw rice. The grade specifications are as follows:

(1) Super: Parboiled rice; not more than 12 percent brokens and discolored grains, general color not below guide sample.

(2) Extra No. 1: Parboiled rice: slightly inferior to "super" but better than No. 1 in color and general appearance and containing not more than 25 percent brokens and discolored grains.

(3) No. 1: Parboiled rice; not more than 25 percent broken grains, general color and appearance not below guide sample.

(4) No. 2: Parboiled rice; not more than 35 percent broken and discolored grains, general color and appearance not below guide sample.

(5) No. 3: Parboiled rice; not more than 50 percent broken and discolored grains, general color and appearance not below guide sample.

(6) Super broken: Parboiled rice containing more than 50 percent broken and discolored grains, color and appearance not below guide sample.

(7) Broken: Parboiled rice containing more than 50 percent broken grains, not as good as "super brokens" but not below guide sample.

(8) White A: White milled rice (not parboiled) containing not more than 30 percent broken grains, the general color and appearance of which must not be below guide sample.

(9) White B: White milled rice (not parboiled) containing not more than 75 percent broken grains and not below guide sample.

(10) White broken: Any white rice lower than Grade B.

(11) Unclassified: Rice inferior to any of the above descriptions.

The Guide samples are established by the Rice Marketing Board at the beginning of each season and are distributed throughout the milling area.

TABLE 13.- *British Guiana: Utilization of rice (in milled rice equivalent), average, 1936-40 and annual, 1942 to 1948*

YEAR	PRODUCTION	EXPORTS	SEED AND FEED USE	APPARENT UTILIZATION
	1,000 pounds	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
1936-40.....	96,094	34,296	11,200	50,598
Year ending September 30:.....				
1942.....	116,641	42,253	12,094	62,294
1943.....	111,418	41,115	11,278	59,025
1944.....	122,927	50,290	14,784	57,853
1945.....	127,118	57,812	22,944	46,362
1946.....	135,905	51,300	23,283	61,322
1947.....	134,801	50,165	17,067	67,569
1948.....	128,531	35,529	17,808	75,194

British Guiana Rice Marketing Board, Georgetown, British Guiana.

Milled rice purchased for domestic distribution by the Board is divided into seven grades, as follows:

(1) Brown A: Parboiled rice of the same color and appearance as "super" under the export grades but containing up to 15 percent broken grains.

(2) Brown B: Any parboiled rice other than Brown A containing not more than 40 percent broken grains.

(3) White (
(4) White B: (Same as export grades.
(5) White Broken: (

(6) Mixed brokens: Any broken rice.

(7) Stock feed: All other unclassified rice.

Producers are required to deliver all rice in excess of on-farm needs to local rice mills at prices fixed by the Board for rough rice, or they have the option of having their rice toll-milled and then selling it to the Board at fixed prices according to grade. Rough rice sales are by grade, with the three major grades designated according to the percentage of red rice. Rough rice grade "A" has less than 12 percent red rice; grade "B," 12 to 15 percent; and grade "C" more than 15 percent red grains.

After milling, all rice must be delivered to the Rice Marketing Board. There are about 200 rice mills in British Guiana, which are usually small. These mills purchase rough rice or mill it on a toll basis. They have open-air concrete drying floors, and vats or drums used for parboiling. Rough rice is delivered by producers in 140-pound bags, and it is then milled and sacked in 180-pound units. All the production is of our medium-grain type, produced in a 165-day growing season. Most of the rice is mixed, and, while some of the grains appear to be Blue Rose, others are more like Fortuna. All varieties are selected locally. Due to the conditions under which it is produced, rough rice is highly infested with red grains. The average red-rice content for rough rice is 12 percent, and some lots produced from "drop seed" contain 50 percent. Two Government mills produce reasonably good quality milled rice, and most of the production of other mills is discolored, has a high percentage of broken grains, and more than a trace of red rice.

More than 98 percent of the rice milled in British Guiana is "parboiled" rice, and less than 2 percent is processed as raw milled rice. The reason for the predominance of parboiled rice is not an economic one, since millers report that it is more expensive to produce this product domestically than to mill raw rice. Because most of the population of British Guiana and the British West Indies is of East Indian origin, these consumers eat parboiled rice as is customary in parts of India.

The two chief bottlenecks in producing parboiled rice appear to be drying and milling. There are no dryers and harvesting seasons frequently are very wet. The practice in drying rice is to spread it out in a thin layer on open-air concrete floors. This is satisfactory on small farms where there is sufficient labor and the volume of production is small enough to allow it to be sacked and moved quickly to shelter when it rains, but it is difficult in large mechanized operations. More important, the rice must be parboiled and redried immediately before milling. Thus, because of weather conditions that make drying very expensive, the rice is parboiled at a higher cost than that involved in producing raw rice, even with a somewhat higher milling yield. In most of the mills the rough rice is soaked overnight in barrels, which usually are discarded oil drums, and then a steam pipe is pushed into the drum and the rough rice steamed for from 10 to 15 minutes.

Prices

All rice prices in British Guiana are under the control of the Rice Marketing Board. This Board fixes the minimum prices to be paid for rough rice at the beginning of each marketing season, establishes the wholesale prices at which mills sell to domestic consumers, and acts as the sole importer of rice, buying supplies from the millers at fixed prices. In general, domestic prices are governed by the price available for the exportable supplies.

The price for rice exported from 1947 to 1949 was established in 1946 at an over-all meeting of food supply workers of the British West Indies. At this meeting, the minimum annual import requirements of rice were established for nine of the islands as follows:

	Pounds		Pounds
Antigua	2,930,000	St. Lucia	896,000
Monteserrat	268,000	St. Vincent	1,792,000
St. Kitts	2,150,000	Barbados	20,608,000
Dominica	582,000	Trinidad	33,600,000
Grenada	2,408,000		

These annual requirements total 65,234,000 pounds of milled rice, the volume determined as needed in excess of domestic production. At the 1946 meeting the British Guiana Rice Marketing Board guaranteed these islands 80 percent of the above stated minimum requirements for the 5-year period beginning in 1947 and ending in 1951, and the contract provided for a 3-year renewal at the end of the first contract. In return for this guaranteed market, British Guiana agreed to sell rice at a fixed price equivalent to about 4 cents per pound, f.o.b. Georgetown. British Guiana also agreed to export rice to no other country until the minimum requirements of these British West Indies islands has been met at the guaranteed price.

In effect, this agreement assured British Guiana of an export market of at least 65 million pounds from 1947 through 1951, but it required the sale of all exportable supplies up to 65 million pounds at about 4

cents per pound. Thus the British Guiana Rice Marketing Board received this price in 1947, 1948, and 1949.

At this export price the 1948-49 fixed price to producers for "Grade A" rough rice was 84 cents per bushel; for "Grade B," 79 cents per bushel; and for "Grade C," 73 cents per bushel. The grades are determined by weight per unit of volume and the percentage content of red rice, with 12 percent content being the standard for "Grade B" rough rice.

The export prices charged by the Board varied from $4.87 per 100 pounds, f.o.b. Georgetown, for "Super"; $4.22 per 100 pounds for "No. 1," and less than $4.00 per 100 for the lower grades. All milled rice for export in British Guiana is packed in 180-pound jute bags.

Rough rice is delivered to millers in units of 140 pounds. Producers requiring milled rice for home consumption had to deliver two 140-pound bags of rough rice for each 180-pound bag of milled rice obtained. This amounts to a milling yield of 69 percent, which is considered the standard return in British Guiana when milling parboiled rice. These producers were charged a milling fee amounting to 61 cents per 100 pounds of milled rice received and were limited to one bag of milled rice for a family per month. For other consumers, the Board allots a monthly volume to distributors who are required to sell at fixed retail prices, which in early 1949 were about 5 cents per pound.

Production Methods

Two crops of rice are produced annually in British Guiana. For the 1947-48 season, a total acreage of 88,900 acres were planted to the first crop, and the same area harvested; for the second crop, 8,700 acres were planted, and 17,700 acres were harvested. The first crop is planted in April and May and harvested in September and October. The second is planted in November and December and harvested in March and April. The difference between the planted and harvested acreage of the spring-harvested crop is due to the fact that about half of it is produced from "drop seed" from the preceding crop. When the land is freshly plowed, the seed shattered out from the preceding crop germinates, and further seeding is not necessary. Although this harvest sometimes contains as much as 50 percent red rice, it is a cheap crop.

About half of each of the two crops is seeded in nurseries. After the land is plowed and puddled with bullocks (fig. 7), the rice is transplanted by hand and is hand-weeded to some extent. This is on the small so-called peasant farms. The remaining 50 percent is plowed with bullocks or tractors, usually under water, and harrowed. Then the seed is broadcast, mostly by hand on wet or flooded land. Although some of the land is artificially irrigated, usually in connection with sugar production, most of the rice is irrigated by collecting the heavy rainfall in the levees, which are plowed up around the growing fields.

The main part of each crop is harvested by hand, shocked in the field for a few days, and then threshed by the trampling of bullock teams, usually under an open palm-thatched shed, and dried in the sun (fig. 27).

Serious thought was given to expanding rice production in British Guiana in 1941-42 when shipping difficulties caused shortages in the British West Indies. The Colony exported only 19 million pounds of milled rice in the crop year 1940-41. The major agricultural product was sugar. When rice shortages appeared in 1942, however, the Department of Agriculture began to consider seriously a rice expansion program and concluded that the best way to increase production, in view of the limited manpower resources and relatively large amount of available land, was to introduce mechanized rice production into the Colony. The first large mechanized-rice-farm plan, now known as the Mahaicony-Abary Development Scheme, was begun in 1943.

The Government took over a large area of "crown land" on the coast located between the Mahaicony and Abary Rivers, about 30 miles from Georgetown. It brought in tractors and combines and began growing rice. On this project the acreage harvested increased gradually from 700 in 1943 to 4,000 acres in 1947. The harvested area decreased to 3,000 acres in 1948, when weather was unfavorable for production. The acreage planted for harvest in 1949 is 4,500 acres.

The rice land in the Mahaicony-Abary project is bare of trees, very flat, and at least 4 feet below sea level during the high spring tides, but it is protected by a concrete dyke, which runs along the coast most of the length of British Guiana. Automatic floodgates are used to drain the land into the sea at low tide, and a central pumping station on a river at the back of the property releases the water into the irrigation ditches. The soil is a heavy grayish, very hard clay with a top layer of black, loose, peaty deposit, organic in character and very fertile. This top layer, called pergasse, averages about 4 inches in depth. According to many observers, about a million acres of such land in the Colony, ranging from 1 to 16 miles in width along the coast, could be developed for rice.

The Mahaicony-Abary project was supposed to demonstrate the practical possibilities of mechanized rice production in British Guiana and thereby encourage local producers to expand production. This project has 75 tractors, including 55 steel-wheel and 20-rubber-tired tractors. It owns 30, 3- and 4-bottom moldboard plows, 30 disk plows, 40 disk harrows, 20 grain drills, 52 tractor-pulled 6-foot combines, 12 self-propelled combines on steel tracks, with cutter-bars of from 8½ to 12 feet, 6 trucks, and 2 jeeps. Of the 75 tractors, 60 are used on the project and 15 are rented out on an operating cost basis to nearby farmers as a means of teaching them the advantages of tractors.

The project is organized into three major divisions, the agricultural operations unit, the milling unit, and the machinery maintenance unit. As the volume of production increased, it became necessary to construct a rice mill on the property. A mill was built by a construction company of Houston, Texas, in 1947-48 and it mills about 10,000 pounds of milled rice per hour. About 50 native laborers are maintained to operate the mill and a peak load of 200 field laborers is maintained during the planting and harvesting seasons.

The Mahaicony-Abary project has been moderately successful, and it has clearly demonstrated the practical possibilities of using tractor

power for puddling, or underwater plowing, fitting, and seeding in heavy-rainfall areas, such as British Guiana. This experiment will probably be continued on an expanded basis, but it now appears that it may not result immediately in a large-scale expansion. Two American rice experts in mid-1949 were employed to assist in improving production methods.

Another major rice project, the Bergenorgen, is a "communal farm" type. It provides 200 families with communal pasture land and rice plots of from 3 to 15 acres. The rice is cultivated by primitive methods, milled on a toll basis in a central mill on the farm, and sold to the Rice Marketing Board by the farm manager. In view of the relatively high price of labor in this area as compared with that in areas in Asia where hand-labor methods of production are economical, this type of project is unlikely to result in an increase in the volume of rice for the export trade.

Outlook

British Guiana's goal for annual rice production is 7,700,000 bushels of rough rice (225 million pounds milled) and for exports, 150 million pounds. Although there is little indication that the Colony will reach this goal within 5 years, there is some indication that steady progress will take place in increasing production. British Guiana is under pressure to expand output to meet its commitments under the 1947-51 contract between the Colony and the British West Indies.

Any area that could successfully market milled rice in 1947 and 1948 at an f.o.b. price of 4 cents per pound is likely to remain in the rice export business for a long time. For this reason, United States producers and millers can expect increasing competition for their prewar export markets in the British West Indies.

Because of climatic difficulties, which cause severe red-rice problems and make the drying of rough rice difficult, this region is not likely to provide severe competition in the high-quality field. Most of the rice yield will continue to be of the short- and medium-grain type, and most of the export supplies will consist of parboiled rice. When and if British Guiana expands production to the point that all of the British West Indies guarantees are met, quality production for the near-by dollar markets in Venezuela and Cuba, and possibly Canada, can be expected.

Mexico

Mexico's current exports of rice are about four times the prewar level, and this country is likely to compete to some extent with the United States in the rice markets of Latin America. Exports in the next few years, however, may not be maintained at recent levels. In 1948, about 21 million pounds of rice was shipped to Cuba, and the Mexican rice industry hopes to establish long-time markets there.

The 1949 rice crop in Mexico is forecast at 8,083,000 bushels of rough rice (240 million pounds milled), 3 percent larger than last year's record of 7,838,000 bushels (230 million pounds milled), according to

reports from the American Embassy in Mexico City. The average prewar (1937-41) production was 4,598,000 bushels (131 million pounds) annually. The estimated planted acreage for 1949 is 215,000 acres, 5,000 acres more than for the preceding year, and approximately 100,000 acres more than before the war.

If favorable weather conditions continue through the December harvest, the 1950 exportable surplus from the new crop is expected to approximate 90 million pounds. The surplus from the 1948 crop for export in 1949 amounted to 80 million pounds, of which 57 million had been shipped by August 1. In 1948, Mexico exported 63 million pounds of milled rice, compared with prewar exports of less than 20 million pounds annually.

The recent increase in production is reported to be due to an expansion of irrigated rice in the Sonora region. Rice acreage and production in the two other important growing districts, Morelos-Puebla and Michoacan, have been relatively stable. In the Sonora rice area, land and water facilities exist that, if there were a sufficient demand for rice, would permit an expansion in production at the rate of about 10 million pounds of milled rice annually for a period of 5 to 10 years. According to reports, there is little possibility of expanding the planted acreage or increasing the yields per acre in the other rice areas of Mexico.

Most of the export supplies are of the Edith and Lady Wright varieties, which are long-grain types of medium quality. Wholesale prices for Edith long-grain rice with a broken grain tolerance of 20 percent were $9.75 per 100 pounds, f.o.b. Guaymas, in June 1949. Four major grades of milled rice are produced, as follows:

1. "Extra No. 1," with a tolerance of up to 12 percent broken grains, no spotted grains, and no chalky grains.

2. "Extra No. 2," with up to 15 percent large brokens, 0.5 percent small brokens, 0.3 percent spotted grains, and 1 percent chalky grains.

3. "Choice No. 1," with 20 percent large brokens, 1 percent small brokens, 0.3 percent spotted grains, and 2 percent chalky grains.

4. "Choice No. 2," with 25 percent large brokens, 1 percent small brokens, 0.3 percent spotted grains, and 2 percent chalky grains.

The moisture content of all milled rice must not exceed 13.5 percent.

The Mexican rice crop is usually planted in July and August and harvested from October to January. Four major variety groups are produced, including native long-grain types, Edith and Lady Wright long-grain varieties that were brought in from the United States about 1925, native medium- and short-grain types, and "American" short-grain rice introduced from California. The majority of the export supplies, however, are of the long-grain types since most of the short-grain supplies are consumed domestically.

Colombia

Colombia offers no prospect as a market for United States rice. Production increased in recent years to the extent that it is now self-sufficient, and there are indications that the crop is more likely to expand rather than to decrease. Serious efforts are being made to develop rice as an important export crop. It is reported that a small surplus will be available for export in 1949, and the chances are that within the next few years the United States industry will encounter some competition from Colombian rice in the Latin American and European markets.

The extent of this possible competition is difficult to appraise. Most of the rice produced is of the Fortuna variety (fig. 13). It is generally classified as long-grain rice and it is of reasonably good quality when well milled and free of red rice. With the increase in production, however, infestations of red rice have appeared so that most of the rice has from 10 to 20 percent red grains. This results in unusually high proportions of stained and off-color grains in the final milled product. Therefore the current quality of the Fortuna rice now produced by most mills in Colombia is not as high as the usual product from the United States. If and when Colombian producers solve their red-rice problem, their rice will be similar in quality to United States Fortuna. Solution of the red-rice problem will come about gradually however, and immediate improvement cannot be expected. In addition, most of the surplus rice-producing areas of Colombia are located in regions distant from ports with intervening mountain ranges, so that transportation from the production areas to the ports is relatively costly, amounting to about $1 per 100 pounds. If Colombia solves its red-rice problem and develops economic production to the point that the transportation costs are offset, it could become an important exporter of rice.

Production, Consumption, and Trade

Trends in rice production from 1934 through 1948 are presented in table 14. These data indicate that rice production has increased over a 15-year period to a 1948 level that was about four times as great as that of 1934. Area planted-and-harvested data for the 15-year period were not available, but indications are that about 375,000 acres were harvested in 1948 with an average yield per acre of 29 bushels of rough rice.

In the prewar period, Colombia was a deficit rice-producing country, importing from 20 to 25 million pounds of milled rice annually in most years from 1935 to 1945 and taking almost 50 million pounds in 1939. After the end of World War II, an increase in domestic production lowered the net import level to about 13 million pounds in 1947 and 10 million pounds in 1948.

Because of the increase in the rice acreage of 1948, Colombia in 1949 shifted from a net importer to a net exporter of rice. During the

TABLE 14.- *Colombia: Rice production and trade, 1934-48*

YEAR	PRODUCTION		IMPORTS (MILLED)	EXPORTS (MILLED)
	ROUGH	IN TERMS OF MILLED		
	1,000 bushels	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
1934.....	2,688	78,624	18,100	-
1935.....	2,714	79,384	20,986	2
1936.....	2,740	80,145	26,759	9
1937.....	2,916	85,293	25,635	4
1938.....	3,657	106,967	26,043	4
1939.....	3,682	107,698	48,982	-
1940.....	4,638	135,662	20,822	-
1941.....	5,429	158,798	351	-
1942.....	5,830	170,528	53	1,675
1943.....	5,901	172,604	57	231
1944.....	7,940	232,245	71	128
1945.....	7,548	220,779	31	320
1946.....	7,410	216,742	1,029	14,178
1947.....	10,230	299,228	13,452	-
1948.....	10,887	318,445	9,921	-

Compiled from official and other sources.

first 6 months of the year, 1.5 million pounds was exported to Venezuela and a barter arrangement was made with an American truck company for the disposal of an additional 500 thousand pounds. According to various trade and Government sources, Colombia was attempting to sell in export markets an additional 22 million pounds of milled rice which it had on hand in the summer of 1949 in excess of domestic requirements. Producers and millers expressed the hope that production would be expanded to the point that they could export from 50 to 100 million pounds annually. The 1949 export surplus was listed at about $9.00 per 100 pounds, f.o.b. Atlantic Coast ports in Colombia. Samples of these supplies indicated that most of the export surplus was of the Fortuna variety with from 25 to 35 percent broken grains, and about 3 percent stained red rice grains.

The indicated per capita consumption of rice in Colombia in 1947 and 1948 was about 25 pounds per year. In the prewar period, consumption averaged less than 20 pounds per person per year. With the increased domestic production there appears to be a significant increase in the per capita consumption. According to reports from observers in this country, the higher rate of consumption has been due to the increase in availabilities and the relatively low price of rice in comparison with the prices for dry beans and yucca, the two other important starchy foods in the Colombian diet. Some observers report that the per capita consumption of rice within the next 5 years will rise by about 10 pounds per year as the anticipated increased supplies become available.

Milling and Marketing

There are about 160 commercial rice mills in Colombia. Some are relatively small, but 16 have a rated capacity of more than 2,000 pounds

milled rice per hour. The older mills have European-type milling machinery imported from Germany and Sweden prior to World War II, but the more modern mills are equipped with milling machinery manufactured in Colombia at Cali and Medellin. This equipment is based on the European Pearling-cone principle, but the hullers and polishers are from one-half to one-third the size of the ordinary Swedish or German equipment. The developers of these machines report that they reduced the size in relation to European-type milling machinery because they felt that the smaller machines would cause less breakage. Most of the mills are operated by electricity, rather than by the steam power generated from rice hulls that is commonly used in the major rice areas of the world. The Colombian millers report that it is cheaper to pay for the electricity for the small mills and discard the hulls in nearby rivers, or by burning, than to buy expensive steam-power generating equipment.

There are practically no rice dryers in Colombia. As a general practice, the millers buy the rice on a "wet basis," after it has been combined, and dry it on open-air, concrete drying floors before storing or milling. To dry the newly harvested rough rice, it is spread out in 1- to 2-inch layers on the concrete yards in the early morning, stirred with shovels or by walking over it occasionally, and then piled up in the late afternoon and covered with canvas to prevent damage from dew or rain. This process is continued for several days, until the rice is sufficiently dry to store. It is then placed in sacks, usually with a capacity of 150 pounds, and placed in warehouses until it is milled.

About 80 percent of the rice produced in Columbia is of the Fortuna variety, the broad long-grain type introduced from the United States about 15 years ago. Fortuna rice appears to be well suited to Colombian climatic conditions, and it has gradually replaced most of the native types. Since its introduction, however, it appears to have been mixed with other types and most samples observed in the mills and in the fields were not comparable to typical Fortuna from the United States. In addition, because of Colombia's cultural practices of planting rice year after year on the same land, most of the rice has become infested with red rice to such extent that rough rice for the country as a whole is estimated to contain an average of 10 percent red rice, and in some areas, this red rice amounts to as much as 30 percent. Other rice varieties produced in Colombia include Early Prolific, a medium-grain type, and several native types that appear similar to the Honduras variety.

Milling percentages for average quality rough rice were reported by the millers to be about 45 percent head rice, 15 percent first heads, and 5 percent small brokens, or a total of 65 percent edible rice. Average percentages of 1.5 percent brewers grains, 2 percent rice bran, 2 percent rice polish, and 29.5 percent hulls and waste were also reported. Since most of the mills do not have separation and remixing equipment, the practice is to shake the brewers grains, bran, polish, and hulls from the milled product and bag the resulting mixture of whole and broken grains as it comes from the cleaner, without attempting to produce rice of a specific broken grain content.

There are two usual grades of rice produced for domestic consumption in Colombia - high-quality and common. The high-quality grade contains about 10 percent broken grains, has only a trace of red rice, contains practically no foreign matter or weed seeds, is well milled, and appears to be similar to the better quality Fortuna rice that is retailed in the United States. This grade is produced by selecting only the best quality of rough rice, which is uniform and well dried, sells for a relatively high price, and represents only about 10 percent of the total milled rice produced. The common grade, which represents 90 percent of total production, is called intergraded rice by the trade. It contains from 25 to 35 percent of broken grains, 2 to 5 percent of striped or stained grains resulting from red rice, has some foreign matter, and in some cases has a yellowish tinge indicative of stack-burn. It appears to be similar to United States Fortuna No. 4 or 5, undermilled.

Prices

For the 1948-49 crop year (July-June) the Instituto Nacional de Abastecimientos (the National Stabilization Board) initiated a price-support scheme for rough rice by establishing a buying program providing a fixed price in some areas that was equivalent to $2.92 per bushel (or $10.50 per barrel) rough rice. In the areas where this program was established, the trade reported that this Government organization found it difficult to maintain the support price, because of the unusually large crop that was harvested in late 1948 and early 1949, and that the average price of rough rice received by farmers for the 1948-49 season amounted to about $2.70 per bushel, or $9.70 per barrel.

During the first 6 months of 1949 wholesale prices for milled rice in Colombia ranged from the equivalent of 14 cents per pound for the high-quality, well-milled, white rice containing less than 2 percent red rice and from 10 to 20 percent broken grains to 13 cents per pound for the common quality containing from 25 to 35 percent broken grains and 2 to 4 percent red rice to 11 cents per pound for chalky rice with 40 percent broken grains and 5 percent red rice. Retail prices for each of these types were about 1 cent per pound higher than the indicated wholesale level. Brewers' grains were selling for $7.00 per 100 pounds and rice bran and polish, for $3.00 per 100 pounds.

Trends in retail rice prices from 1935 through 1948 in the four most important cities in Colombia are shown in table 15. In Bogota, for instance, retail prices fluctuated around 5 cents a pound from 1935 to 1940, then gradually increased during the war years to about 10 cents a pound in 1946, to about 13½ cents a pound in 1947, and to 15 cents a pound in 1948. Although rice prices have declined somewhat since 1947, in most other areas of the world, up to July 1949 there was no indication of a price decline in Colombia. This appears to be due to inflationary trends, which have not been retarded since the end of the war and to an increase in the demand for rice.

These relatively high prices point to the major difficulty that the rice traders are currently facing in their efforts to export rice. With

TABLE 15.- *Colombia: Average retail rice prices in 4 major cities, per 100 pounds, 1935-48*[1]

YEAR	BARRANQUILLA	BOGOTA	MEDELLIN	CALI
	Dollars	*Dollars*	*Dollars*	*Dollars*
1935	4.07	5.30	4.87	4.87
1936	4.11	4.98	4.96	3.89
1937	4.50	5.05	5.44	4.15
1938	4.68	5.37	5.55	4.70
1939	4.87	5.68	5.68	5.26
1940	5.70	5.55	6.48	4.30
1941	5.85	5.87	7.16	4.74
1942	7.02	6.67	7.78	5.46
1943	8.79	9.26	9.26	6.29
1944	9.07	8.52	9.90	7.96
1945	10.29	9.81	9.79	9.26
1946	10.31	9.81	10.79	9.16
1947	13.89	13.42	13.89	12.40
1948	14.77	15.03	14.00	13.24

[1] Converted from Colombian pesos at the official rate of $0.51 per peso.
Arroz, Ministerio de Agricultura Y Ganaderia, Bogota, Colombia. June 1949.

the greatly increased available supplies in 1949, they are doubtful that the entire crop can be marketed domestically without causing a serious decline in prices. Therefore, they would like to export about 20 million pounds to hold domestic supplies at a level that will maintain the mid-1949 rice price structure within the country. However, because of this high internal price level and also because of the resulting high prices paid to producers for rough rice, prospective exporters have not been able to obtain export offers at a price that would permit them to break even on the transaction. They have succeeded in obtaining a preferential exchange rate of about 30 cents per peso on dollars received from rice exports in contrast to the official rate of 51 cents per peso. This in effect reduces the costs of rice bought for export from the domestic wholesale price of $13.00 per 100 pounds to $8.00 per 100 pounds. Since the surplus-rice-producing areas are located in interior regions distant from the market, transportation costs over the mountains to port cities average $1.00 per 100 pounds. The result is that Colombian rice dealers feel that they must obtain at least $9.00 per 100 pounds, f.o.b. coastal ports, to break even. Since the rice they have to offer at this price is the "common" grade, with 20 percent or more broken grains and more than a trace of red rice and since that quality of rice is selling in most world markets at about $7.00 per 100 pounds, they have had few offers.

Production Methods

There are three major rice areas in Colombia: These are (1) the coastal zone near the Atlantic and Pacific coasts; (2) the coastal plains zone in the flat swampy lands along the major rivers leading to the sea; and (3) the interior upland (fig. 12) regions in the wide valleys between mountain ranges. The coastal zone produces only one crop annually, which is planted in July and August and harvested in November and December.

FIGURE 8. Planting rice in Colombia. The man on foot is operating a broadcast seeder; the mounted workers carry the seed and mark the area covered.

FIGURE 9. A newly seeded rice field in Venezuela.

FIGURE 10. Weeding a rice field in Peru.

FIGURE 11. Bird control in Colombia's rice fields. Boys pop fiber whips at birds to keep them from destroying maturing rice.

Cultivation methods in the zone are largely primitive, being without planned irrigation. This crop is usually sown (fig. 8), harvested, and threshed by hand.

The coastal plains zone also produces one crop annually, which is sown from April to June and harvested in August and September. In this area most of the production is upland rice also produced by primitive methods and without formal irrigation. This is a region of many small farm plots scattered along the lower Magdalena River.

In the interior regions, two main crops are produced annually. The first is sown in April and May and harvested in July and August. The second is sown in August and September and harvested in December. In these areas, rice is produced largely by mechanized methods with the use of tractors for plowing and fitting, grain drills for seeding, self-propelled combines for harvesting, and continual irrigation from gravity-flow systems from nearby mountain streams.

There are some exceptions, however, to this general production outline. There are some mechanized and irrigated regions in both the coastal and the coastal plains zone. In addition, one small region near the Atlantic coast produces its crop by hand-transplanting methods typical of most of Asia. Also, in the interior regions, the climate is such that rice can be planted and harvested every month of the year. In these wide valleys varying from 500 to 4,000 feet in elevation, there is little variation in the length of day and in the temperature, and where sufficient water is available for irrigation the producer can plant the crop any time of the year. In general, the largest part of the crop in these areas comes from the spring crop, planted in April and May and harvested in July and August, and the fall crop, planted in August and September and harvested in December. Planting according to this schedule has the advantage of growing rice in the two annual rainy season, May and September.

Normally, the coastal zone produces about 20 percent of Colombia's total rice; the coastal plains zone produces about 30 percent; and the interior valleys about 50 percent. Production in the coastal plains zone, however, is usually either above or below the average in any given year. In this area along the lower Magdalena River basin the wide variation from year to year in the size of the rice crop appears to be the result of two major factors: (1) Most of the crop is upland rice, which is dependent upon natural rainfall that for good yields varies greatly from year to year; and (2) the crop is produced by many small, independent producers who depend upon outside credits to finance their production. When the outlook for marketing rice is good, these producers can obtain the credit; when prospects are doubtful, their production is restricted by lack of credit.

Because of the yearly variations in the harvest of the coastal plains zone that cannot be estimated until the crop moves to market, this regions usually exerts the greatest influence on Colombia's rice-production pattern. Since the other areas have a relatively stable production from year to year and the country as a whole is about self-sufficient the production of the coastal plains area determines whether Colombia is a

net importer or a net exporter of rice in a given year. Weather conditions in 1948 were good and credit was extended. Because the yields per acre were large, Colombia in 1949 became a net exporter of rice.

Colombia's future development as an exporter of rice, however, will be determined more by developments in the valleys in the interior, especially in the Upper Magdalena areas, the Cauca Valley, and the region near Medellin, than by changes in other sections. The rice lands in most of these interior valleys appear to be fairly fertile, and producers have an average yield of from 10 to 16 barrels of rough rice per acre from two crops a year on the same land continuously for 5 years or more without fertilization.

The typical irrigation systems are of the gravity-flow type with canals frequently running 10 miles or more from the mountain stream inlet to the farms. The irrigation practice is to keep running water moving through the growing rice and down the slopes all the time. There are few contour levees, and the sloping land of many fields is such that farmers find it easier and more efficient to keep water running through the fields than to construct contour levees that might break during heavy rains and wash out part of the crop. This method of irrigation, however, keeps barely an inch of water in the rice fields and causes severe erosion on some soils, which makes it necessary to abandon the fields after a few years. It is also impossible to use fertilizer efficiently, as it is soon washed out by the rapidly moving water. Also, because of the low water levels, weed growths cannot be kept down.

The land is plowed with tractors and disk plows. Seeding is done with grain drills or with the hand-operated broadcasting seeder, after which the land is disked lightly to cover the seed. The land is then flooded lightly to stimulate germination, drained, and held in the dry state until the plants are 4 to 6 inches high. At that time, the levee at the upper end of the field is opened, and outlets are provided at the lower end. Running water is then introduced and maintained in most cases until a week before harvesting. Most of the harvesting in these interior regions is done with self-propelled rice combines (fig. 16) imported from the United States.

The rough rice is usually sold on a "wet" basis to a nearby mill. The mills must then dry the rough rice before milling or storing. There are practically no mechanical rice dryers in Colombia. The common method of drying is to spread the rice out evenly in thin layers on open-air, concrete drying floors (fig. 26) and stir it occasionally for from several days to a week or longer, depending upon the amount of sunshine and rainfall, until it is dried sufficiently to store or mill. Since days or weeks often elapse before the harvested rice reaches the mill, this method of harvesting and drying appears to be a major cause of the yellowish tinge indicative of stackburn in the milled rice and of the high breakage in the mill.

The most important rice production problem in Colombia is the control of red rice. With the practice of growing two crops a year every year on the same land, red rice has gradually become such a problem that the average contamination is 10 percent for the country as a whole and

FIGURE 12. An upland rice region in a Colombian valley. Much of the rice of Latin America is produced in small plots on steep slopes, by hand methods, and without irrigation.

FIGURE 13. The author examining a field of heavy yielding Fortuna rice in Colombia.

as much as 30 percent in some areas. Under the ideal growing conditions in Colombia, short-grain red rice, long-grain red rice, and all the intermediate types are grown. There is little or no organized clean-seed production in most of the country and the result is that both the seed and the land, in most cases, have become infested with red rice. It is now claimed that the varieties being used revert back to red rice or cross too easily with existing red types. Actually, however, the cultural methods whereby the fields are continually planted to rice, without rotations, appears to be the cause.

In addition to the red-rice factor, weeds are also a serious problem. Weed growth is aggravated by the shallow irrigation practices and the transfer of weed seeds from one field to another by the running irrigation water. Most of the weeds, however, are of the broad-leaf type and the more progressive rice producers are finding that 2, 4-D applications are an effective control.

Bird destruction of the maturing crop is also a difficult problem to combat. The usual method of control is to place around the fields small boys, each of whom is equipped with a long fiber whip (fig. 11), which is popped at intervals of 3 to 5 minutes from daylight to dark in order to frighten the birds away. During the most serious bird-infestation month of February, large quantities of fireworks are used or "anything that will make a noise," to scare the birds away from the fields.

Outlook

Colombia, now producing sufficient rice to supply its normal per capita requirements and a slight surplus for export, has sufficient land and water to expand production to from two to three times the current level. In the major production areas of the interior, the rice producers have progressed further toward complete mechanized production than was evident in any other country in Latin America: thus, they have the mechanized experience along with the land and water to expand production. In addition, the leaders of the rice industry appear to be alert to developments such as 2, 4-D weed control.

All of these factors point toward an increase in production. Furthermore, the Government is cognizant of the need for an increase in foreign exchange and hopes to export rice. There are several basic factors, however, that may retard the exportation of a large volume. The heaviest per capita consumption of rice is in the areas along the coast, where production normally is not sufficient to meet domestic needs and where the climate and topography are such that the crop is not uniform or of export quality. The surplus areas where rice of export quality is produced and where there is the greatest potential for expansion are in the interior. These regions have one or more rugged mountain ranges between them and the coastal ports, and transportation to the ports is difficult and expensive. Millers from these areas reported that the shipping costs from the mill to the port ranged from $13.00 to $30.00 per short ton, and there is little indication that transportation costs will decline in the near future. If rice in the interior of the

country is to become important as an export commodity, it must be a product that is 1/2 to 1-1/2 cents a pound cheaper than that of nearby Ecuador in order to offset the high transportation costs from the interior.

The undetermined potential expansion of the domestic rice consumption constitutes another factor that may retard exports from Colombia. Some Government officials and members of the trade estimate that the country could consume about twice the rice produced if it were available at a reasonable price. To illustrate this trend, they point out the increased per capita consumption in recent years and the current demand for rice at relatively high prices. Thus, even though domestic production does increase materially, this added volume may be consumed within the country before it reaches export markets. The industry appears to be less interested in a possible rise in domestic consumption than in the expansion of export markets, as members of the trade expect higher profits from exports.

Taking into consideration these production and marketing difficulties, there is little indication that Colombia will become an important factor in the world rice trade before 1951. Colombians do, however, have the potential for expansion and the will to do so, and a considerable volume of exports could be established in 2 to 5 years. Rice production for the country as a whole is likely to continue to increase. Large fluctuations from year to year in the size of the total crop will continue owing to variations in the crop of the coastal plains zone, but the production in the interior is likely to be increased on a stable, mechanized basis.

Uruguay

Uruguay's level of rice production was almost three times as great in 1949 as in the prewar (1936-40) period. The planted acreage increased from 13,000 to 33,000 acres annually, and production from 866,000 bushels to more than 2 million bushels. Prior to the war, Uruguay exported minor quantities of rice, shipping annually about 3.8 million pounds in terms of milled. Production gradually increased and 1948 exports totaled 27 million pounds. Export supplies for 1949 are expected to be at least as large as those of the preceding year.

Rice is planted in November and December and harvested in April. As in southern Brazil the major types produced are Blue Rose medium-grain and Japanese short-grain.

About 80 percent of the crop is produced in the Northeastern Departments next to Rio Grande do Sul, Brazil, and the remainder is grown in other sections of the country in small plots. The major rice acreage is in an area of level land, where the water supplies for irrigation are pumped from streams and lakes. Production is on a semimechanized basis, with some tractor plowing, tractor harrowing, and machinery threshing. Irrigation is accomplished by Diesel and steam engines. Fertilizers are not used but a standard rotation of 2 to 3 years in rice followed by 3 to 5 years in pasture is practiced. This area is reported to have additional land that could be planted to rice.

Paraguay

The rice acreage and production of Paraguay in 1949 were about four times the prewar (1936-40) average. The planted acreage before the war averaged about 5,000 acres annually and production, 196,000 bushels of rough rice; in 1949, approximately 20,000 acres were planted and 857,000 bushels harvested. Paraguay formerly imported some rice, taking about 300,000 pounds of milled rice annually. Production expanded to the point that the domestic demand was supplied, and the country now exports a small quantity. The export surplus for shipment in 1949 has been estimated at about 6 million pounds of milled rice.

Rice farming in Paraguay is much like that of southern Brazil. "Blue Rose" is planted on about two-thirds of the acerage, and the "Japanese" short-grain variety on the remainder of the rice land. The crop is planted in November and harvested in April and May.

Government plans are now under way to expand rice production. The long-time goal envisages more than 100,000 acres and an annual export surplus of 200 million pounds. Per capita consumption is relatively low, varying from 5 to 10 pounds annually, and most of the increase in production reportedly will be exported. A recent Government report on the rice industry lists four major difficulties encountered in the expansion program: (1) Inefficient application of irrigation, (2) lack of machinery, (3) low-quality seed, and (4) lack of technical advisors. Under the new national rice plan, however, steps are being taken to remedy these shortcomings. Advisors from the United States have been employed, improved seed from the United States and Brazil has been imported, experiments in mechanization are in progress, and controlled irrigation by Government allocation of water supplies is being maintained.

Surinam

The rice acreage of Surinam increased from an average of 37,000 acres in the prewar period (1936-40) to 45,000 acres in 1948. Production expanded from 1.7 million to 2.9 million bushels of rough rice. Exports formerly averaged were 11 million pounds annually but increased to nearly 40 million pounds of paddy and milled in 1948. The per capita consumption of this area is estimated to be from 150 to 200 pounds yearly.

There are an estimated 14,000 families growing rice on small family plots mostly for home consumption. Producers, being of British Indian and Javanese descent, grow much of the rice according to transplanting methods of Asia. Annual rainfall ranges between 90 and 110 inches and most of the year it is sufficient for irrigation. In the dry months, September and October, however, some irrigation is needed to mature the crop. Irrigation at that time is accomplished with a series of dams that retain the water from coastal streams at high tide and drain the fields at low tide. This system is similar to that in nearby British Guiana. In both countries, two crops are produced annually.

Recently the Government has encouraged the expansion of rice growing by (1) granting small tracts of land to producers at easy terms,

(2) helping to finance production costs, and (3) assisting in mechanization. Some mechanization of the industry is in progress along the same lines as in British Guiana, including plowing and fitting under water, broadcasting on flooded fields, and mechanical harvesting. The main crop is planted in April and harvested in July, and the second is planted in August and harvested in November and December. Most of the varieties are medium and short-grain types.

Dominican Republic

In the prewar period the Dominican Republic was a net importer of almost 8 million pounds of milled rice annually. Beginning in 1940 the country became a net exporter and continued in this position until 1947, when a short crop resulted in net imports of about 8.2 million pounds. In 1948, about 500,000 pounds of milled rice was exported, most of which went to Cuba. The Republic is expected to be self-sufficient in rice, with the possibility of small export supplies in some years.

The rice acreage increased from the average of 80,000 acres annually before the war (1935-39) to 114,000 acres in 1948. Production increased from 2.9 million bushels to 4.2 million bushels. Because of a decline in prices, the 1949 crop is not expected to be as large as for the preceding year.

About two-thirds of the planted acreage is irrigated (lowland rice) and the remainder is nonirrigated (upland). Most of the irrigated rice is of the "Buffalo" type, a semilong-grain rice, while the unirrigated rice is of the Fortuna variety. Although rice is planted and harvested to some extent throughout the year, the heaviest plantings begin in May and extend into September. Seventy-five percent of the crop is harvested from late October through February.

The per capita consumption of rice in the Dominican Republic is reported to fluctuate between 50 to 60 pounds annually.

El Salvador

The 1948 rice crop of El Salvador, produced by around 18,500 growers, is estimated at 39,000 acres and 1,300,000 bushels harvested. Domestic consumption is expected to be about 30 million pounds, leaving an expected export surplus of about 7 million pounds. Exports in 1948 were slightly more than half this level, most of which went to Panama.

Most of the rice is of the upland type, normally planted in June and July at the beginning of the rainy season and harvested from October through December. Some Fortuna is planted, but most of the varieties are native, long-grain types similar to Honduras. Yields average about 35 bushesl of rough rice per acre.

Honduras

Prior to the war, relatively little rice was produced in Honduras and imports amounted to about 2.5 million pounds annually. During the

1940's, however, production expanded to the extent that all domestic needs were met and exports in 1948 were more than 3 million pounds. The 1948 planted area was estimated to be 24,000 acres as compared with 20,000 in 1947; total production in 1948 was about 763 thousand bushels of rough tice, or an average yield of 26 bushels per acre.

Most of the production is of the upland type planted by hand methods without irrigation. The crop is usually planted in May and June, just before the heavy seasonal rains of July and August, and is harvested in October and November. The most important variety is Fortuna although some Nira and some local long-grain varieties are grown. Much of the domestic production is hand pounded and consumed in the areas where produced.

Haiti

Haiti imported about 2.4 million pounds of milled rice annually before the war, but production has now increased to provide this country with domestic requirements. The 1948 acreage comprised about 55,000 acres, of which 10,000 acres were cultivated under canal irrigation. The remainder was partly lowland (irrigated) rice and partly upland rice, cultivated on mountain slopes. Production for 1948 is estimated at approximately 1,150,000 bushels of rough rice (and 35 million pounds milled). The per capita consumption in Haiti averages about 20 pounds annually.

A new reclamation and irrigation project now nearing completion is expected to provide about 60,000 additional acres of cropland, which will be under controlled irrigation. Some of this land is allotted to rice and Haiti is likely to become an exporter of rice when this materializes.

Most of Haiti's crop is planted in May and June and harvested from August to December. The major improved varieties are Fortuna and Excelsior, introduced in 1941 and 1942. About 35,000 farm families produce rice, and the average rice acreage per farm is less than 2 acres. Much of the rice is hand pounded on the farms.

DEFICIT RICE REGIONS

On the basis of imports in 1948 the major deficit-rice countries of the Western Hemisphere are Cuba, the British West Indies, Canada, and Venezuela. The countries having minor imports include Bolivia, Panama, Costa Rica, British Honduras, the French West Indies, the Netherlands West Indies, and French Guiana. Before the war Argentina, Chile, and Colombia also imported relatively large quantities of rice. Production increases and other factors in these three important prewar rice importers have placed them on a self-sufficient basis, and they are not expected to purchase substantial quantities of foreign rice in the next few years.

Historically, Cuba has been the most important rice market in the Western Hemisphere. In the prewar period, approximately one-half of the 900 million pounds of rice imported by the countries of the Hemisphere came into Cuba. That country's relative importance as a potential rice market increased during the war and early postwar years, because of

FIGURE 15. One of the many irrigated rice valleys of Peru.

Markets in Europe and possibly Asia may improve this position somewhat and since United States rice is in demand, it will have preference in some markets as long as it maintains its standards for high-quality rice. Thus a realistic outlook for the next 5 years is a possible market for United States rice in the deficit areas of the Western Hemisphere of from 500 to 600 million pounds annually. Other markets must be found for production in excess of this volume.

Most of the demand in the Western Hemisphere deficit countries that have dollar exchange with which to purchase rice is for long-grain, high-quality types. This demand factor makes it imperative that the United States industry maintain the production of long-grain rice and withhold the qualities that are likely to cause dissatisfaction, reduce the demand, and stimulate competition from other production areas from these export markets.

Cuba

In recent years, Cuba has become the most important foreign outlet for United States rice. It imports from us about four times the volume it did before the war and takes about a fourth of our total production. Practically all of the rice imported by Cuba during the first 9 months of 1949 and most of the imports during 1948 came from the United States. Approximately 610 million pounds of the 620 million pounds imported in 1947 were of United States origin. In contrast, before the War Cuba obtained about twice as much rice from Siam as from the United States and imported large quantities from Burma and French Indochina as well.

Cuba is one of the most quality-conscious rice markets in the world. Most consumers prefer, demand, and pay relatively high premiums for the rice they feel tastes and cooks best, and they will buy second-quality types only when the first choice is unobtainable. Most consumers prefer Rexora rice. Their preference for Rexora and the other United States variety, Bluebonnet, which is quite similar, is such that 100 percent brokens of the Rexora variety will move faster and bring a higher price in the retail markets than 4 percent brokens of well milled, Zenith rice or other similar medium- and short-grain types.

Rice imports from the United States in the near future, however, are likely to be conditioned by provisions of the General Agreement on Tariffs and Trade (GATT), which was negotiated in 1947 and became effective in 1948. This agreement permitted Cuba to establish an import quota of 330 million pounds on milled rice with additional quantities above this volume to be imported at double the import duty rates. Provisions of the agreement permit the Cuban Government to establish an over-all quota, with or without individual country allocations, as the Government deems desirable. Individual country allotments have not been established in 1949. If and when such an allocatiin is set, the shares allocated will be in proportion to imports from importing countries during the 10 calendar years immediately preceding the first year in which the allocation is made. If this had been done in 1949 the proportion of imports from the United States would have been 78 percent of the 330-million-pound

quota (table 16). This would have been about 260 million pounds, or about one-half of recent annual shipments from the United States.

TABLE 16. - *Cuba: Rice (in terms of milled) imports by country of origin, for selected periods, 1934-48*

COUNTRY OF ORIGIN	1934-38	1939-43	1944-48	1939-48	
	Million pounds	*Million pounds*	*Million pounds*	*Million pounds*	*Percent of total*
United States	83	287	395	341	78.1
Ecuador	0	24	43	34	7.7
Siam	220	54	0	27	6.2
French Indochina	30	21	0	10	2.4
British India and Burma	103	8	0	4	.9
Chile	0	8	5	7	1.5
Mexico	0	6	4	5	1.1
Brazil	0	0	1	1	.1
Other countries	6	3	14	7	2.0
Total	442	411	462	436	100.0

Compiled from official sources.

For 1949, however, Cuba established a total import quota of about 450 million pounds. The rate of consumption in 1949 was such that this import quota was filled by November 1. Present indications are that the Cuban Government will adjust the quota provision to permit additional supplies from the United States to be imported without the added tariff.

Another measure designed to aid Cuban producers was a resolution by the Cuban Government on April 12, 1949, which ordered customs officials to collect a full 6-percent sales tax on all imported rice, with the accrual placed in a general fund of the Treasury. This sales tax has the effect of an additional tariff charge averaging 83 cents per 100 pounds that thereby affects the advantages of the GATT agreement. The application of the GATT provisions and Cuba's local taxes should be watched by American exporters in order to keep abreast of the picture there.

The United States rice industry, and more especially that of the Southern States where long-grain rice is produced, is highly dependent on Cuba as the most important market for rice. There is no indication at the present time that this market will be lost, but recent developments in Cuba indicate the demand for United States rice may be reduced. Thus, current factors affecting the Cuban rice picture should be checked carefully by the United States industry from time to time.

Production, Consumption and Trade

Cuba's rice imports for the most recent 10-year period (1939-48) have averaged 436 million pounds annually (table 16). Of these imports, about 78 percent have been from the United States, 8 percent from Ecuador, 6 percent from Siam, about 4 percent from other Asiatic countries, and the remainder from Latin America. According to the provisions of the GATT Agreement, these percentages would be the ratios used in dividing the Cuban import quota of 1949 if individual country allocations were made.

The United States' volume and share of Cuban rice imports have increased rapidly in recent years. Average rice imports into Cuba from the United States equaled 83 million pounds annually in the 5-year period, 1934-38, increased to 287 million pounds annually from 1939 to 1943, and to 395 million pounds annually from 1944 to 1948. More than one-half of the total United States exports in recent years were delivered to Cuban markets.

Cuba's rice imports from all countries in the 1948-49 marketing season approximated 500 million pounds. This import volume was 70 million pounds less than that of the preceding year but somewhat higher than the prewar average (1935-36/39-40) of around 420 million pounds (table 17).

The annual consumption of milled rice is now estimated at about 580 million pounds. According to recent Government data used in connection with rice import-quota determinations, the 1948 domestic production of

TABLE 17. - *Cuba: Rice (in terms of milled) imports, August-July, 1943-44 to 1947-48*

MONTH	1943-44	1944-45	1945-46	1946-47	1947-48
	Million pounds	*Million pounds*	*Million pounds*	*Million pounds*	*Million pounds*
August	27	28	16	17	13
September	29	42	34	6	35
October	62	48	55	18	103
November	30	61	39	29	96
December	34	38	59	55	96
January	36	48	48	43	16
February	35	39	39	30	5
March	44	33	31	75	34
April	33	21	34	77	26
May	26	24	19	44	94
June	19	15	20	55	40
July	46	22	34	22	13
Total	421	419	428	471	571

Compiled from official statistics.

milled rice amounted to 130 million pounds. If the production is subtracted from estimated 1949 needs, the indicated import requirements for 1949 are 450 million pounds. Cuba probably will continue to require from 400 to 500 million pounds of milled rice imports for the next few years.

The per capita consumption of rice in Cuba is nearly 100 pounds annually. It is consumed primarily as boiled white rice, served separately, and is not usually served with gravies, beans, other foods, or seasonings. Consumers appear to have concluded that long-grain rice of the Rexora or Bluebonnet type is the best quality rice, when it is cooked and served as a separate dish, and they will purchase other types only if this type is not available.

In contrast to many other countries where there is a general preference for "long-grain," the Cuban consumer wants the "Rexora-type." Fortuna rice, in most countries, is considered a reasonably high-quality, long-grain type. In Cuba it is classified price-wise as a medium grain

and, on the basis of current retail prices of about 15 cents a pound for 20-percent broken Rexora, Cuban consumers will not pay more than 12 cents a pound for Fortuna of the same grade. Nira, Edith, and other long-grain types from the United States are regarded in the same class as Fortuna.

Cuban brokers, wholesalers, retailers, and consumers commented generally that if the United States rice industry wants to maintain the Cuban market, more Rexora and Bluebonnet and less Zenith, Early Prolific, and Pearl types should be shipped.

The general opinion is that the preference for the Rexora type will continue as long as Cuba has reasonable prosperity and sufficient buying power to purchase the preferred type. In the event of a decline in buying power, however, consumers probably will revert to the prewar depression habit of buying the greatest volume for the money regardless of quality. Dealers report that there will always be a small demand in Cuba for low-grade, short-grain rice to supply low-income consumers. As long as sugar prices remain fairly high, this short-grain rice will be restricted to small lots totaling 10 percent or less of gross imports. The preferred type of this rice is Early Prolific, rather than Blue Rose or Zenith.

There is practically no demand for packaged rice. The consumer usually purchases rice only after careful examination and is skeptical of the quality of the product if he cannot examine it. One large mill in Havana in July 1949 had men opening 2-pound packages of high-grade, Rexora-type rice and placing it into sacks before moving to the wholesale trade. The United States rice mill could have obtained just as good a price for the product in 100-pound sacks as in the small, expensive containers. There also is no demand for parboiled rice, shown by the fact that some parboiled rice sent from the United States to Cuba in 1946 was still in the warehouse of the purchaser.

Milling and Marketing

Almost half of the rice produced in Cuba is grown on small plots by sugar plantation laborers and is hand-pounded on the farms where it is produced. The milling implements used in this case are the same as in many other parts of Latin America and in parts of Asia--the hollowed-out log and wooden mallet (fig. 28). The remainder of the Cuban crop is produced on larger farms and moves to nearby mills. Most of these mills are relatively small. They use electricity for power, discard the rice hulls, and sell their product in nearby villages and small towns. Practically all of the rice consumed in the larger cities is imported.

The Honduras is the most important variety grown in Cuba. This long-grain, short-season type is popular because of its high yield under adverse weather conditions. The quality, however, is not so good as that of the imported Rexora or Bluebonnet types, and it usually sells for 2 to 3 cents a pound less than imported rice. The average volume of milled rice obtained from rough rice is reported at about 63 percent, including from 20- to 25-percent broken grains. In some cases

locally grown rice is blended with imported types of higher quality to produce a lower-quality, but uniform blend for sale to the low-income classes.

Since a large part of the rice consumption of Cuba is imported, the brokers, importers, and wholesale distributors of imported rice comprise a major part of the trade. There are no ceiling prices on rice, but the importers and wholesalers are required to operate at a maximum percentage-profit margin over legitimate costs. Costs on imported rice in mid-1949, as reported by dealers and wholesalers, were as follows:

Cost per 100 pounds of milled rice

1. F.o.b. price, Rexora milled, 20 percent broken grains, at southern U.S. ports	$ 11.10
2. Freight, southern U.S. ports to Cuba	1.16
3. Insurance	.06
Total c.i.f. cost	$ 12.32
4. Customs charges:	
A. Basic import duty	.85
B. Port-improvement tax	.03
C. 25 percent surcharge on port-improvement tax	.01
D. Civil retirement tax	.02
E. 6 percent on duty-paid gross sales tax	.80
Total customs charges	$ 1.71
5. Banking charges:	
A. 0.1 percent exchange charge	.01
B. Five-eighths of 1 percent bank commission	.08
C. 2 percent surtax on money export	.25
D. Revenue stamps	.03
Total banking charges	$ .37
6. Other costs:	
A. Customhouse brokers fee	.01
B. Stamp taxes	.01
C. Plant quarantine and quick-delivery fee	.01
D. Drayage from wharf to warehouse	.09
Total other costs	$ .12
Total cost delivered to warehouse in Havana	$ 14.52

The above-listed schedule of costs indicates a price spread of about $3.50 per 100 pounds between the f.o.b. price at southern ports in the United States and the price in the wholesale warehouse in Havana. Since rice imported from countries other than the United States bears about the same schedule of costs except for double the basic import duty, costs for rice of this quality brought in from other countries, assuming a similar f.o.b. price, would be about $15.37 per 100 pounds. This would be a price spread of about $4.35 per 100 pounds between the f.o.b. price and the delivered price, or a cost about 24 percent higher than the cost of similar rice imported from the United States. Although the United States has a theoretical protection of 50 percent according to

the Reciprocal Trade Agreement, the actual protection is less than half of this amount, due partly to other charges assessed by Cuba which are constant regardless of the source of the imports.

Prices

Since September 1947 the Cuban Government has followed a policy of flexible ceilings for imported rice and no ceilings on the domestic product. The law permits wholesalers to sell imported rice on the basis of legitimate costs plus a profit margin of 10 percent. It permits retailers to sell at costs plus 20 percent. Local rice usually sells at prices competitive with those of the imported product, quality considered.

Wholesale prices, which include customs fees and other costs itemized heretofore plus dealers profits, have been about 25 percent above the c.i.f. prices. In July 1949, wholesale prices per 100 pounds for the standard 20 percent brokens Early Prolific were about $9.25; for Fortuna, $11.25; and for Rexora, from $14.00 to $15.00 per 100 pounds. Retail prices in Habana varied from 17 cents a pound for first quality Rexora with 20 percent or less broken grains to 15 cents for second-quality Rexora with up to 40 percent brokens, 14 cents for Fortuna, and from 12 to 13 cents for Early Prolific and Zenith.

Production Methods

Cuba's 1948 planted acreage is estimated at about 133,000 acres, the harvested crop at 123,000 acres, and the average yield per acre at 24.4 bushels of rough rice. This gives a production of 3 million bushels of rough rice, or the equivalent of about 88 million pounds milled. The crop available for consumption in 1949, allowing for seed, is about 80 million pounds, or approximately 14 percent of the consumption requirements. Preliminary estimates of the 1949 crop are: planted area, 130,000 acres; harvested acreage, assuming normal weather conditions, about 120,000 acres; and production, 2,890,000 bushels, or slightly less than the record of 1948.

In the prewar (1935-39) period, an average acreage of only 45,000 acres was planted annually from which 965,000 bushels of rough rice was produced. The 1948 crop was about three times as great as that of prewar years. The acreage expanded during the war years because of an extreme shortage of rice and resulting high prices. From 1944 to 1946, retail prices on the black market rose as high as 30 to 40 cents a pound.

Most Cuban observers believe that production has reached its peak and that current levels will be difficult to maintain. There reportedly are several basic factors that may prevent an expansion materially above current levels or may cause a decline in production. Heavy weed growth throughout the year is the major problem. In most areas, land can be cleared of brush and planted a year or two with good results, but thereafter the occurrence of weeds reduces the yields per acre below economic levels.

Another problem is the development of a variety that will meet consumer preference and produce high yields under local climatic and soil conditions. The Honduras variety is planted on about 90 percent of Cuba's rice acreage, as it produces the largest per acre yields. Although this is a long-grain rice, it is not so much in demand as Rexora. One dealer reported that the sale of Honduras at $9.00 per 100 pounds wholesale was difficult, while at the same time imported Rexora was moving readily at $12.00 per 100 pounds. Honduras has another disadvantage in that it lodges badly, and numerous trials with different types of harvesting machinery have met with little success. In spite of these disadvantages, however, producers report that Honduras will continue to be the principal variety grown because it is the best adapted to the local climate and soils.

Still another factor that retards the rice-growing enterprise is a shortage of water for irrigation. Some producers have recently drilled deep wells where there are shallow ground-water resources. If rice prices remain at relatively high levels, extensive development in this direction can be expected.

About 40 percent of Cuba's rice is cultivated by dry-land production methods on small farms. The rice is planted on rolling land in plots usually ranging from a tenth to a half acre in size. The plots are plowed with oxen teams, except on freshly-cleared and burned over areas where no plowing is needed, and are planted by hand in May and June. The crop is planted in hills about a foot apart, with from three to five seeds dropped per hill--the total seed requirement amounting to about 20 pounds per acre. This dry-land rice is weeded, cultivated, cut, and threshed by hand during the growing season, and it is usually hand-pounded and consumed on the farms where produced. The remainder of the crop is on land that is plowed with tractor-plow equipment, and the rice in many cases is harvested by mechanical means. The plots are diked-up to hold the rainfall, and in some cases, additional water is pumped into the field. Because most of the crop is Honduras, which lodges so that it cannot be picked up successfully with the combines, a common mechanical-harvesting practice is first to cut the crop with a large mowing machine, fitted with a swather attachment, windrow the crop, and let it dry on the stubble for several days, and then move down the windrow with a combine equipped with a pick-up reel to thresh the crop. This method results in excessive shattering, compared with United States methods, but most Cuban producers who use mechanical harvesting methods report that it is the only practical way to do the job.

Another major factor retarding rice production in Cuba is the unavailability of sufficient water for efficient irrigation. Although there are wide expanses of fairly level but relatively infertile land in some areas of Cuba that are not now cropped, there appears to be a limited supply of water in most areas. Recently, however, some producers have dug deep wells in areas where practically no ground water resources are reported, and if rice prices hold at the relatively high current levels, more of this development can be expected. A visit to one of these newly developed areas indicated that the water could be obtained if a well

were dug every 150 acres. Because of the sandy, porous soil, the water would have to be pumped constantly during the growing season.

Because of the limited availability of water, most of the Cuban crop is planted in April, May, and June and harvested in September and October. The rainy season begins in May and extends through October. In this manner, the crop is timed to take advantage of the natural rainfall and most of the crop is only semi-irrigated. The Cuban agricultural census of 1945 indicated that only 1.4 percent of the 28,800 rice-producing farms had irrigating equipment but a total of 10.8 percent of the seeded area was irrigated. These data indicated that only 1 percent of the farms used fertilizer and only 4.9 percent of the area seeded to rice was fertilized.

Outlook

The most important factor affecting United States rice markets in Cuba in the immediate future is the way in which the Cuban Government applies provisions of the GATT agreement. If this Agreement is used as a tool to hold supplies at a low level, increase domestic prices, and stimulate the local rice industry, United States rice markets will be reduced. If it is applied after a realistic picture of the size of domestic production is considered, it will have little effect on our market.

Over a long period of time, the GATT provisions permit Cuba to establish a quota at a level only slightly more than one-half of recent import levels and about one-fourth less than prewar import levels. Even in this event the United States rice industry would apparently still have the current preferential advantage in tariff rates. However, even with this advantage, the over-all high tariff wall would most likely hold Cuban rice prices at such high levels that total consumption might decline with the result that markets would then be reduced.

In the event the GATT provisions are established and maintained in their entirety, there is one indicated advantage to United States rice producers. In future years, if individual country allotments of the over-all quota are made, the United States rice industry will receive the major share of the quota volume, since the quota is allotted on the basis of performance in the previous 10 years, and very little rice will be imported from the major prewar exporting countries of Asia, since they have shipped only small quantities to Cuba in the past 10 years. These countries include Siam, Burma, and French Indochina. If, however, an over-all quota is established without individual country allocations, this advantage will not exist.

Trinidad and the Other British West Indies

For some years to come Trinidad and the other British West Indies will need imports of from 70 to more than 100 million pounds of milled rice annually. United States rice-industry representatives may be able to market some of their export supplies in these islands. There is a

shortage of dollar exchange in that area, however, and most of the West Indian import requirements are likely to come from British Guiana or other sterling-block countries. Much of the demand of these islands is for "white parboiled" rice. British Guiana produces this type of product, but production in that colony has been insufficient to meet all demands of the British West Indies. This indicates a possible outlet in the Carribean area for some of the short-grain parboiled types produced in the United States.

The most important rice deficit area in the West Indies is the island of Trinidad. Trinidad alone will require annual imports of about 40 million pounds. Jamaica, which in the prewar period was the principal British West Indies market for United States rice, will apparently need almost as great a volume of imports as Trinidad. The other islands, including Antigua, St. Kitts, Dominica, Grenada, St. Lucia, St. Vincent, and Barbados are likely to require a total of about 30 million pounds of milled rice imports annually.

Normal consumption requirements of rice in the British West Indies, excluding Jamaica, are estimated to be about 160 million pounds of milled rice annually. The average domestic production has been about 50 million pounds a year. This leaves a deficit, excluding Jamaica, of more than 100 million pounds. In addition, Jamaica's annual prewar imports averaged about 42 million pounds. There is thus a possible demand in the British West Indies for about 150 million pounds of imported rice annually. Because of exchange difficulties, however, actual average imports probably will be less than the potential demand.

Production, Consumption, and Trade

The 1948 rice production in Trinidad equaled 38 million pounds of clean rice produced from 23,500 acres. This represented an increase of less than 1 percent over the 1947 crop. Total domestic requirements for the Island are estimated to be about 70 million pounds annually. Domestic production in 1948, although at the highest level in history, accounted for only 53 percent of total need. Trinidad's rice production has increased gradually since 1925 and an average of about 20 million pounds of milled rice was harvested in the 1935-39 period. Because of severe shortages during the war years, production almost doubled from 1940 to 1948. Due to land and water limitations, however, there appears to be little possibility that any further large-scale expansion is possible. Trinidad and Tobago will continue to be deficit in rice.

The minimum annual import requirements of rice for the islands of the British West Indies were established at an over-all meeting of food supply workers late in 1946. The milled-rice requirements of these islands in excess of domestic production totaled 65 million pounds. These import requirements were as follows: Antigua, 2,930,000 pounds; Montserrat, 269,000 pounds; St. Kitts, 2,150,000 pounds; Dominica, 582,000 pounds; Grenada, 2,408,000 pounds; St. Lucia, 896,000 pounds; St. Vincent, 1,792,000 pounds; Barbados, 20,608,000 pounds; and Trinidad, 33,600,000 pounds. The rice requirements of all the British West Indies are not

listed here. Jamaica's prewar import requirements alone are approximately 40 million pounds.

At the same meeting the British Guiana Rice Marketing Board contracted to supply the islands with 80 percent of the stated minimum annual requirements for a 5-year period beginning in 1947. At the end of this period the contract may be renewed for a 3-year period. It was indicated that the over-all annual consumption of rice in the British West Indies (probably at the prewar rate of consumption) would approximate 150 million pounds of milled rice.

British Guiana has not found it possible to supply Trinidad or the other British West Indies with all of the rice guaranteed in the 1947-51 contract. Instead, of the anticipated annual import of 35 million pounds, Trinidad received 26 million pounds from British Guiana in 1946; 21 million in 1947; and 18 million pounds in 1948. In addition to the 1948 imports from British Guiana, Trinidad imported 9 million pounds from Brazil. Thus Trinidad's rice imports in 1948 were about 27 million pounds as compared with the prewar annual average of around 40 million pounds and the wartime average of nearly 35 million pounds.

Trinidad and Tobago have a population estimated at 500,000 and the disappearance of rice in 1948, taking into consideration domestic production and imports, was about 130 pounds per person. In the prewar period the average per capita consumption was about 150 pounds. Most of the population of Trinidad and Tobago are of East Indian and African descent and they consume large quantities of rice.

Milling and Marketing

Practically all of the rice produced domestically in Trinidad is consumed in the rural areas where produced. There are no large rice mills, and most of the production is stored on the farms in the form of rough rice, which is processed as needed. It is milled in the same way as most of India's production. Rough rice sufficient to meet the family needs for about a week is "parboiled" in open kettles, dried by spreading on a hard surface exposed to the sun, and then "hand-pounded" in the farm home. This home milling is done with mortar and pestle equipment, sometimes consisting of a hollowed-out log and a large wooden stick. When a surplus above home needs exists, some of the hand-pounded rice is sold in local markets. A few of the larger villages have small, power-operated rice mills. These mills operate primarily on a toll basis, and the millers market their share of the output in nearby areas.

The milling outturn under the hand-pounding methods usually is estimated to be from 50 to 55 percent, but some observers believe that it is as high as 60 percent. Since practically none of the crop moves into commercial channels, there are no available official data regarding yields per acre or milling outturn.

All imports are under Government control, and wholesale and retail prices are rigidly supervised. The Government supply board follows a policy of allocating import supplies to the larger cities and sugar farming areas where domestic production is not sufficient to meet the

need. Because of inadequate supplies, rice was rationed in Trinidad in mid-1949. The ration was three-fourths of a pound a person per week. Rice was the only commodity rationed in Trinidad and, in view of the current and prospective supply situation, most observers report that product will be rationed for several years.

Prices

Imported supplies of parboiled milled rice from British Guiana in 1947, 1948, and 1949 cost the Trinidad Government less than 4.5 cents a pound delivered at Port-of-Spain. This relatively low price resulted from the 5-year contract between British Guiana and several British West Indies islands. Supplies from British Guiana, however, have not been sufficient to meet all needs and additional imports from Brazil have been necessary. Imported Brazilian rice in 1948 and early 1949 cost about 10 cents a pound delivered at Port-of-Spain.

Wholesale and retail prices have been rigidly controlled at relatively low levels. Although the higher cost of Brazilian rice caused the average f.a.s. cost for all imported rice to increase to 6.6 cents a pound in 1948, the retail price of imported rice was maintained at 6.1 cents a pound in the urban districts and 5.6 cents per pound in the rural areas. These prices were maintained in 1949 by means of Government subsidies.

The fixed price for Trinidad's 1949 rough rice crop was $5.60 per barrel, or $1.33 per bushel. The controlled retail price of hand-pounded milled rice, produced from domestic rough rice in mid-1949 was 5.9 cents a pound. Because of short supplies, however, there was little local rice available at the controlled prices and in some areas of the island a black market in this rice was reported with prices from two to three times the listed level.

Production Methods

Most of the rice crop is produced by hand-culture methods on small farms on plots of from 2 to 5 acres. About 85 percent of the 1948 crop was irrigated swampland rice. This is cultivated by peasant farmers of East Indian descent and sugar plantation workers under conditions similar to those common in India. It customarily is plowed and puddled under water, transplanted and cut by hand, and threshed by hand or by the use of bullocks. The remaining 15 percent was planted to upland rice, or the so-called hill rice of Trinidad. Here the crop is grown by Negro hill farmers also under primitive conditions. A hillside usually is cut and burned. The rice seeds are "dibbled" into the freshly burned-over land by digging holes with a hoe, or a stick, dropping several seeds in each hole, and covering with the foot. The land is not plowed or harrowed. The crop is not weeded and it is cut and threshed by hand. Both crops are planted from April to June and harvested in December. Practically no irrigation is practiced, as the 65-inch rainfall of the 5- to 6-month growing season usually provides sufficient water.

Because of the severe rice shortage in recent years, there has been much interest in the expansion of Trinidad's domestic crop. A recent report on the island by a committee of agricultural experts, including workers at the Imperial College of Tropical Agriculture, has suggested two major approaches to this problem. The committee reports first, that a 50-percent increase in yield per acre is possible with the use of selected seed, improved water control by grading of the fields, and by improved cultural practices during the dry season. The experimental results show that upland rice varieties from Peru increase rice yields about 25 percent. Other suggestions for increasing yields included the use of fertilizers, tractor plowing for improved seedbed preparation, and threshing machines for harvesting.

The second approach was an expansion of the planted area by draining swamplands and by interesting hill land farmers in upland rice production. From 8,000 to 10,000 acres were reported available for immediate development, and including long-time mechanization possibilities, a total of 30,000 acres of idle land could be planted to rice without reducing the sugar acreage. The cost of this reclamation, however, was estimated at about $200 per acre.

Outlook

Trinidad and the other British West Indies islands will continue to be dependent on rice imports for a large share of their total consumption requirements. Production is likely to increase, but it may not be more rapid than the population increase, thus the current import deficit should be maintained. Although production can be expanded rapidly at a relatively high cost, the declining world prices for rice are likely to make such a program less attractive than during the war years.

Because of the long-time bilateral agreement with British Guiana, most of the imports of the British West Indies will come from British Guiana. This Colony cannot supply all requirements, however, and United States producers have some chance of marketing rice in these islands if the desired quality is supplied and price competition is met. The British West Indies do not require high-quality, long-grain rice. The domestic crop is of the medium-grain type and is parboiled, and the major imports are of this type. Price is likely to be the determining factor in selling rice in this market.

Venezuela

Venezuela offers good prospects as a market for United States rice. Domestic production is only about half of the normal need, and, although increasing, it is not expected to equal local requirements within 5 years. Although the total imports will probably be small in comparison with shipments to Cuba, Venezuela has the dollar exchange to pay for United States rice, and its consumers have a preference for United States, high-quality rice. The Venezuelans like long-grain rice of the Fortuna and Rexora types that is well-milled, clean, and white, and if

FIGURE 16. Combining rice in Colombia and sacking it for hauling to the dryer.

FIGURE 17. Hand harvesting rice in a field on a fazenda near Eli Rhu, Sao Paulo, Brazil.

FIGURE 18.- Threshing rice in Rio Grande do Sul, Brazil.

FIGURE 19. Threshing rice in Ecuador. The dry stalks are beaten on a large cloth spread out on a hard surface.

United States prices for this type are in line competitively, a stable market there for small quantities is likely to be maintained.

Venezuela's rice imports are expected to be from 20 to 45 million pounds annually. The 1948 imports equaled about 30 million pounds and those in 1949 are expected to approximate that volume. Imports in 1949 have come mostly from the United States, Ecuador, and Colombia. The latter two countries are likely to continue as the major competitors for the Venezuelan market. These countries produce long-grain rice of the Fortuna type. However, during 1949, imported United States rice sold at a premium in Venezuela because of the product's uniform quality, the degree of milling, and the United States shippers' practice of delivering the full weight of the quality offered in the sample. If our industry maintains these high standards, it should maintain a large share of this small, but important, rice market.

Production, Consumption, and Trade

Postwar rice production in Venezuela has been about three times as great as the prewar (1936-40) average. Rice shortages during the war caused the Government to begin an expansion program that included the introduction of new varieties and pure seed, the establishment of centralized farm equipment pools, and other types of assistance. These efforts, combined with the high domestic price of rice, have caused a rapid increase in production. The harvest increased from an average of 275,000 bushels of rough rice annually to more than 1,000,000 bushels in 1948 (table 18). Assuming normal weather conditions, the 1949 crop is expected to exceed the 1948 level. Although there are no official estimates of the planted acreage, most observers place that in 1948 at about 30,000 acres and expect the 1949 area to be about 35,000 acres.

TABLE 18. - *Venezuela: Rice production and imports, average 1936-40, annual 1946-48*

YEAR	PRODUCTION		IMPORTS	PRODUCTION PLUS IMPORTS
	Rough	Milled		
	1,000 bushels	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
Average:				
1936-40	275	8,044	32,924	40,968
Annual:				
1946	838	24,512	33,995	58,507
1947	671	19,627	29,235	48,862
1948	1,050	30,712	33,000	63,712

Compiled from official and unofficial sources.

In the prewar period, this country produced only about 20 percent of total needs and imported an annual volume of about 33 million pounds of milled rice. In 1948, total imports were the same but made up a

smaller proportion of the total consumption, due to the increase in local production; domestic production in 1948 was about 40 percent of the total supply. The per capita consumption of rice is relatively low, averaging about 15 pounds annually or a total of about 60 million pounds for the Venezuelan population of approximately 4 million. Consumption has been relatively stable, however, and is expected by some observers to increase as rice supplies become more plentiful.

Milling and Marketing

According to a recent census of industries, there are 129 rice mills in Venezuela. Most of these are the relatively small local-type operators; 17 are classified as having a milling capacity of less than 55 pounds of milled rice per hour; 24 are rated at from 55 to 219 pounds per hour; 65 are rated at 220 to 659 pounds per hour; and only 23 are listed at more than 660 pounds per hour. Of these mills, 39 are owned and operated by the Government and 90 are in private hands.

The Government-operated mills are under the control of the "Banco Agricola y Pecuario" and represent about a fourth of the rice-milling capacity of the country. These mills were gradually acquired by the Government during the war for use in maintaining minimum price guarantees to producers and in holding wholesale and retail ceiling prices at the announced levels. In addition to operating these mills, during the war the Government also acted as an importer of rice, bringing in and distributing it through the local units of the Agricultural Bank. In 1949, however, the Agricultural Bank announced it intended to withdraw from importing rice. With the increase in world supplies, private importers have been able to obtain sufficient deliveries to maintain competitive prices; thus it is believed that the importing function of the Bank of maintaining price stability and preventing undue speculation is no longer necessary.

The Bank still maintains the Government-owned mills and keeps their minimum-price program to growers in operation.

The average milling percentage from rough rice is reported to be 65 percent total edible rice. This includes from 45- to 50-percent whole milled rice, and 15- to 20-percent broken grains. The practice in milling is to sack the whole and broken grains, without separating and remixing, and sell the 5-to-10-percent yield of rice bran and small brokens as livestock feed. The milled product, consumed mainly in the rural communities where produced, is relatively low in quality in comparison with high-grade imported rice. Most of the milled rice consumed in the larger cities of the country such as Caracas is derived from imported supplies. The cost of transportation from the production areas or the seaports is a major factor in the relatively high wholesale and retail prices for rice in these cities. Caracas, for instance, is located on a mountain plateau where transportation costs more to move rice from the nearby seaport of La Guaira, less than 50 miles away, than to ship it from the United States to the seaport. Most of the important cities have similar transportation problems.

Rice appears to be more widely used as infant food in Venezuela than in most of the countries of the Western Hemisphere. An intensive advertising campaign by a large concern has been carried on over a period of years informing the population of the value of "arroz farina" (rice flour) as a baby food. This program has included frequent use of the radio and the press and a widespread use of outdoor advertising.

Prices

Venezuela in recent years has been one of the highest-price rice markets in Latin America. The average Venezuelan wholesale price for milled rice was about 13 cents a pound in 1945 and 1946, increased to 14 cents in 1947, and to more than 14.5 cents in 1948. This price represents the cost of medium-grain and undermilled, long-grain of the Fortuna type with 20 percent or more broken grains and compares with the Blue Rose price in the United States.

Rice prices follow a definite seasonal trend, being lowest in the October-to-December period, immediately after the major harvest in September, and highest in the July-to-September period supplies are low. From 1945 to 1948, average wholesale prices varied between 1 and 1.5 cents a pound from the low to the high months (table 19). Because of this seasonal pattern, United States millers who ship rice to Venezuela are likely to find more promising markets from July to September than in the heavy shipping season beginning in October.

TABLE 19. - *Venezuela: Average wholesale prices for milled rice, per pound, 1945-48*

MONTH	1945	1946	1947	1948
	Cents	*Cents*	*Cents*	*Cents*
January	12.5	12.3	13.1	14.2
February	12.5	12.4	13.2	14.2
March	13.6	12.7	14.2	14.4
April	13.1	12.8	14.0	14.9
May	13.1	13.1	14.0	14.6
June	13.2	13.2	14.2	15.1
July	13.2	13.4	14.6	14.4
August	13.4	13.1	14.9	14.2
September	13.2	12.8	15.0	15.7
October	12.8	12.9	14.4	14.6
November	12.5	12.9	14.4	13.9
December	12.4	12.9	14.4	13.9

Source: American Embassy, Caracas, Venezuela.

Venezuelan consumers prefer long-grain white, highly milled rice and pay a 2- to 3-cent per pound premium over medium-grain for this type. They do not like yellow milled rice or that having a trace of red grains. In contrast to Cuba, however, there appears to be little price preference between Fortuna and Rexora. Thus United States producers of Fortuna who have experienced difficulty in marketing this type of long-grain rice in Cuba may develop a market for it in Venezuela. Also,

because of price differences, there has been a market in the past, and there is likely to be a future market for some medium-grain rice of the Blue Rose and Zenith type. Although not liked as well because of cooking qualities, the low-income classes will continue to purchase some of this type of rice.

Producer prices for rough rice have been controlled by annual Government-established minimum rates and supported by purchases by the Agricultural Bank. Support prices for the 1949 crop were placed at $3.15 per bushel or $11.35 per barrel, of rough rice. Based on a 65-percent outturn of milled from rough, this rough rice price will cost the Government about 10 cents a pound of milled rice in addition to the milling costs. It hopes to place this rice on the wholesale market at around $12.00 per 100 pounds and set the retail ceiling at 14 cents a pound.

Much of the 1949 crop will be harvested in an experiment in central Venezuela from September to December. It will be of the medium-grain Zenith variety, produced by upland methods. Since the consumer preference is for long-grain rice, some fear has been expressed in Venezuela as to consumer acceptance of this medium-grain crop.

Production Methods

Most of the rice regions of Venezuela produce only one crop annually. It is planted in April and May, at the beginning of the rainy season, and harvested in July and August, when the rainy season usually slackens for a few weeks. Seeding rates vary from 18 to 36 pounds per acre for upland rice and from 50 to 75 pounds for irrigated rice (fig.9).

About 80 percent of the rice acreage is sown to upland rice, which is planted at the beginning of the rainy season on rolling lands without irrigation and without levees to hold the rainfall. It is produced in the same way United States farmers raise oats and other small grains. The weed problem, which usually prohibits the production of rice by such methods, is solved by burning over the land just before plowing, planting for 2 to 3 years consecutively, then abandoning the land to jungle again. It amounts to a 20-year rotation, with 3 years in rice and 17 years in trees.

Of this upland rice, about two-thirds is produced under the "machete," or hand type, culture. The land is cleared by machetes, burned, plowed by oxen team, seeded by hand, cut with machetes, and threshed by hand. In some of these regions such as the Orinoco Delta where rainfall is very heavy, the crop is harvested as it is in Java by cutting off the grain heads, tieing them in bundles, and hanging them on the walls of the houses to dry sufficiently to thresh.

The remaining third of the upland rice and most of the 20 percent of the crop that is irrigated is produced under mechanized conditions. For this production, tractors are used for plowing, in most instances, and harvesting is done with binders, the small 6-foot tractor-propelled combines, and in a few cases the larger self-propelled combines. All of this machinery has been imported from the United States. Most of the

irrigated rice is watered by means of gravity-flow systems wherein small mountain streams are dammed to create a reservoir and a series of ditches and flood-gates control the flow. There is also a small amount of Diesel-pumping from surface streams, and several small public-power irrigation systems exist.

Although combines are used, there are no rice dryers in the farming areas. After harvesting, the crop is usually spread out in a thin layer on the concrete floors of large drying sheds and turned frequently. When drying is completed on the mechanized farms, the rough rice is sacked and stored in warehouses on the farms or in Government warehouses. The smaller supplies of the many growers who use more primitive methods are usually stored in the farmhome until used or sold to a local buyer. Some rice is hand-pounded on farms for home use, but most of it is taken to nearby mills and toll-milled or sold.

As an indication of the production potential of Venezuela, one large farm that was carrying on an interesting type of production program on a large mechanized scale was visited. The Venezuelan producer on this farm had planted about 450 acres to rice and was irrigating the land by means of a private gravity-flow system, based on a reservoir in a nearby mountain range. In the second week of April, he had rice in all stages of growth. His practice is to start planting about the first of November and plant about 75 acres a month for the 6-month period ending in April. Thus he was plowing land for rice, seeding rice, irrigating rice for the first time, irrigating and weeding more mature fields, draining others where the crop was almost mature, and harvesting still other fields with self-propelled combines. From this point, he carried the process one step further. After cutting the crop, he re-flooded the fields and was producing a second or stubble crop from all the land on an organized commercial basis. Thus by obtaining two crops a year from one planting, his harvesting season begins in February and continues through November. He reported average yields of 26.8 bushels of rough rice per acre on the first cutting and 8.9 bushels per acre for the stubble crop. His most serious problem, in common with rice farmers throughout Venezuela, is the control of the rice birds that feed in the rice fields from April to October. He reported average costs of $24 per acre for labor to patrol the fields to keep out the birds and still has losses from the birds.

The preferred variety of rice in Venezuela is Fortuna, which makes up 80 percent of the total production. A native, longer-grain type, similar to that produced in Colombia, is also produced there. Experiment Station results over a 6-year period show that the Zenith variety, an even more recent United States production, yields about 50 percent more per acre in Venezuela under the upland (dryland) rice farming conditions than do the other varieties.

Based on these results, fairly large experimental plantings of Zenith were made in 1948 in the State of Portuguesa in western Venezuela. This region has large areas of gently rolling land, which can easily be put into dryland rice. The results of these tests under 1948 farm conditions were unusually good. For that reason, 330,000 pounds of Zenith

seed had been imported from the United States, and an additional 150,000 pounds was purchased from local farmers for use in this area for a Government-sponsored rice-expansion program in 1949.

This seed was distributed and planted in April in blocks of from 100 to 500 acres per farm. This project is expected to provide an additional 11,000 acres of rice, and, based on last year's experimental yields, to produce 430,000 bushels of rough rice above that normally produced in the established areas. If the 1949 experiment is a success the 1950 program will be expanded in dryland farming areas to produce 750,000 bushels of Zenith rice above the production of 1948. Although this goal may not be realized, the project should result in some increase in Venezuela's rice production within the next 2 years.

Outlook

The long-time future of rice markets in Venezuela appears to depend primarily on the success of the large-scale experimental plantings of upland rice which were initiated in 1949. If this development is successful, the country can be expected to become self-sufficient in rice production within 2 to 5 years. If not, Venezuela will continue to import from 20 to 45 million pounds of rice annually for some time to come.

Upland rice plantings were greatly extended in 1949 because of unusually good harvest of 1948. Weather conditions in 1948, however, were very favorable and rainfall was sufficient to produce a good yield without irrigation. It was reported that the 1948 rainfall in the upland rice areas of Venezuela and nearby Colombia was the most favorable in years and that such conditions cannot be expected in more than 1 in 10 years. Thus over a period of time, yields can be expected to be lower than in 1948.

In addition, the upland plantings were primarily of Zenith rice, a medium-grain variety from the United States. This is planted because it produces higher yields than the native varieties. All the native types, however, are of the long-grain varieties similar to Fortuna and Honduras, which the consumers prefer. When large supplies of native medium-grain rice are placed on the city markets, it may be that the city consumers will still prefer the high-quality imported rice.

For these reasons, Venezuela may not immediately become self-sufficient in rice production. Thus the United States rice industry has some prospect of continuing to market some rice in this country, which is one of the few that has both the demand for good rice and the dollars to pay for it.

Panama

Panama is not expected to be an important market for milled rice in the next few years. Domestic production is expanding to the point that all local needs will be met without imports. This is expected to be

attained by 1950. However, certain physical and climatic factors will make it difficult to increase production to the point that Panama can become an exporting nation.

There is a possibility, however, that a highly profitable market for good-quality seed rice can be developed. The local varieties in many instances are mixed with respect to size and type of grain and in some cases highly contaminated with red rice. These varieties have a wide variation in maturity resulting in excessive losses when harvested by mechanized methods. Growers therefore are interested in the possibilities of obtaining clean seed of uniform high-quality varieties from the United States.

Production, Consumption, and Trade

Very little rice was imported into Panama in the first 6 months of 1949. Most observers estimate that milled rice imports of about 6 million pounds will be needed in the last half of the year.

On a per capita basis, Panama has been one of the largest rice consumers in Latin America. The average consumption per person is about 150 pounds annually - 50 percent higher than that of Cuba. In 1948 the country consumed 119 million pounds of milled rice, of which 107 million pounds was obtained from domestic production and 12 million was imported (table 20). During the past 10 years, Panama has produced from 80 to 90 percent and has imported from 10 to 20 percent of its total requirements. The 1948 imports came from El Salvador, Nicaragua, and Ecuador. In previous years, rice was imported from a number of countries in Latin America and North America, including small quantities from the United States.

TABLE 20.- *Panama: Rice acreage, production, imports, and price, 1941-49*

YEAR	PLANTED ACREAGE	PRODUCTION		IMPORTS	AVERAGE IMPORT PRICE
		Rough	In Terms of Milled		
	1,000 acres	*1,000 bushels*	*1,000 pounds*	*1,000 pounds*	*Cents per pound*
1941.....	73	2,143	62,683	8,457	.07
1942.....	75	2,185	63,911	9,643	.11
1943.....	82	2,400	70,200	6,354	.11
1944.....	87	2,544	74,412	11,523	.12
1945.....	101	2,901	84,854	11,180	.13
1946.....	114	2,669	78,068	7,222	.20
1947.....	128	2,987	87,370	14,637	.17
1948.....	134	3,691	107,962	10,559	.19
1949[1/].....	148	3,900	114,000	-	-

[1/] Preliminary estimate.

Compiled from official statistics.

Panama may be self-sufficient in rice in a year or so if its output continues to increase at the present rate. Production has increased gradually since the beginning of World War II, and if the 1949 goal is realized, 3,900,000 bushels of rough rice, or 114 million pounds of milled rice, will be produced. This harvest would nearly approximate 1950 requirements.

Although Panama may soon become self-sufficient in rice, it is not likely to expand production to the point that significant quantities can be exported. The current expansion program has resulted from both direct and indirect subsidies. These probably will be continued, but the present high price guaranteed by the Government indicates that the cost of production is too high to permit free competition at current world prices.

Milling and Marketing

All rice imports and all sales of local rice are controlled by the Government through the activities of "El Banco del Agro-Pecuario and Industrial" (the Agricultural and Industrial Bank of Panama). Although a tariff on imported rice--now listed as 2.7 cents a pound on milled rice and 1.8 cents a pound on rough rice imports--was established in 1941, this tariff is ineffective since the Agricultural and Industrial Bank is the only legal importer of rice.

The Bank supports rough-rice prices at $6.00 per 100 pounds, the price established for the 1948 crop and maintained for the 1949 harvest. If rough rice is purchased by the Bank, it is milled in one of three large mills that it owns and operates. The wholesale ceiling price for milled rice in 1949 was fixed at $13.00 per 100 pounds.

Nearly all of the domestic rice is long-grain, mixed with Fortuna or Honduras varieties. Panama's consumers, like those of Cuba, appear to prefer the long-grain, hard types; but they do not seriously object to a large percentage of broken grains. Grades are not used by the trade; all rice is sold "mill run," or as it comes from the polisher without separation of broken grains. Millers estimate that the average milling percentages of milled products from rough rice are as follows: Whole rice, 40 percent; broken rice, 22 percent; bran, 8 percent; and hulls and waste, 30 percent.

Most of the 78 operating rice mills of Panama are relatively small and process only about 37 percent of the domestic crop. The remainder of the harvest is retained on the farms, where it is consumed or saved for seed. The rice utilized on farms is hand-pounded as it is needed. A hollowed-out log and a heavy pole or mallet are used--the same equipment that prevails in a large part of Asia. Many of the small-farm producers prefer the taste of stack-burned yellow rice and intentionally store the rough rice in such a way as to produce the desired results.

With the relatively high prices the producers are receiving for rice, the government-subsidized tractor and combine pools, and the recent demonstrations that have proved to Panama landowners that rice can be produced by mechanized methods, there has been much interest in bringing in modern milling equipment and mechanical dryers. In July

1949 the Agricultural Bank completed arrangements to purchase three large mechanical dryers from a firm in the United States, and a large private producer is constructing his own dryer similar to the Louisiana State University "farm dryer," which was developed and for which plans were published in 1948. These mechanical rice dryers, the first to be used in Panama, are expected to be in operation during the latter part of the 1949 harvesting season. In addition, four moisture testers have been purchased. Also, two new sets of milling machinery purchased recently from the United States are complete with facilities for cleaning and broken-grain separation, and these will be in operation during the 1949-50 milling season. All of these factors point toward a gradual improvement in the quality of Panama rice.

Production Methods

The traditional method of cultivating rice in Panama has been the hand-culture, upland type (fig. 14), and about 90 percent of 1948 and 1949 production was grown in this manner. In general, the cultural practices are the same as those employed in the production of upland rice in Colombia, Venezuela, Brazil, and other upland-rice areas of Latin America. In Panama, an average of 3 acres per farm family is planted during each crop season, and two crops are produced each year on most farms. Most of the rice is planted on rolling-to-steep lands, and fields with a 20-to 25-percent slope are frequently seen.

The general practice is to cut down the trees, brush, and weeds at the end of the rainy season, and then burn off the field. When the first rains come, the farmers go over the field with a pointed stick, punch holes in the burned-over soil about 8 inches apart, with a foot between rows, and drop from three to six seeds in each hole before covering with the feet. After the rice comes up, they go through the field occasionally with a machete, cutting out all weeds. Usually, from three to five weedings per crop are required. When the crop matures, it is cut by hand, and the most common procedure is similar to that practiced in Java and parts of Malaya--that of cutting the heads only by the use of a small knife held in the palm of one hand. The heads are then tied in small bundles and either placed up in the rafters of the bamboo-type homes, where the smoke and heat from the cooking fires circulate overhead and dry out the rice, or, on the larger farms where there is not sufficient storage of this type, the heads are shocked in the field to partially dry before threshing. On most farms, only a small amount is threshed out as needed by placing the bundles of heads on the floor and treading on them, then winnowing in the wind. The rice is then either sold to a nearby miller or Government agent or hand-pounded on the farm for immediate consumption. The second crop of the year is planted in the stubble field immediately after the first crop is harvested. It is cultivated and harvested in the same manner. The field is abandoned in about 2 years and allowed to grow up to trees and brush again, since the yields decline drastically after that time, largely because of soil erosion and increasing weed infestation.

Panama has a distinct dry season beginning in late December and lasting through April, during which time no rice is grown, and a fairly uniform rainy season extending from May to mid-December. Monthly rainfall records indicating these seasons follow:

TABLE 21.- *Panama: Monthly average rainfall*

MONTH	RAINFALL	MONTH	RAINFALL	MONTH	RAINFALL
January.....	Inches 1.0	May.....	Inches 8.0	September.....	Inches 8.2
February.....	Inches .6	June.....	Inches 8.4	October.....	Inches 10.2
March.....	Inches .7	July.....	Inches 7.3	November.....	Inches 10.5
April.....	Inches 2.9	August.....	Inches 7.8	December.....	Inches 4.7

The first rice crop therefore is usually planted in early May and harvested in September, and the second crop is planted in late September and harvested in December and early January. Since there is some variation in planting dates on different farms, however, the harvesting season reaches its peak in September and continues until mid-January. Because most of the crop must be harvested during the rainy season, the drying and storage of rough rice presents a serious problem. Most observers estimate that about 10 percent of the annual crop deteriorates in storage and most of the remainder is seriously lowered in quality.

As a result of the rice shortage during the war and the resulting high prices, some producers began to experiment with mechanized production in 1941. They started by tractor-plowing fairly level plots and seeding the fields with grain drills, and then producing the crop from natural rainfall, by hand-weeding and hand-harvesting methods. Later, combines were brought in, largely of the small tractor-pulled type. In general, these small combines were not found to be successful, as they bogged down during the wet harvesting season, and the grain-drill planting were found to produce relatively low yields because they could not be weeded effectively. Beginning in 1948, however, the producers started experimenting with 2, 4-D for weed control and began putting steel or wood tracks on the small combines, and they found that they could produce the crop reasonably well under these conditions. In late 1948, four large self-propelled combines mounted on tracks that were brought in proved to be even more useful in harvesting the crop. By 1949, there were about 25 small tractor-pulled combines and five large, self-propelled combines in the country and these will be used in harvesting part of the crop. According to data supplied by the Ministry of Agriculture, 13,000 acres, or slightly less than 10 percent of the total estimated crop, has been planted in fairly large fields by grain-drill methods and will be harvested by mechanized methods this year. Even this mechanized culture, however, is grown as upland rice, dependent on natural rainfall, and the fields are not flooded, resembling oat or wheat fields rather than rice. Some of these fields were fairly free of weeds while others were badly infested. The only irrigated rice in the country is a 40-acre plot at the Divisa experiment station. A 5-acre plot planted last year, the first irrigated rice ever grown in Panama, gave yields that were from two to four times as great as the usual yields of upland rice.

FIGURE 20. Stacking rice in Peru.

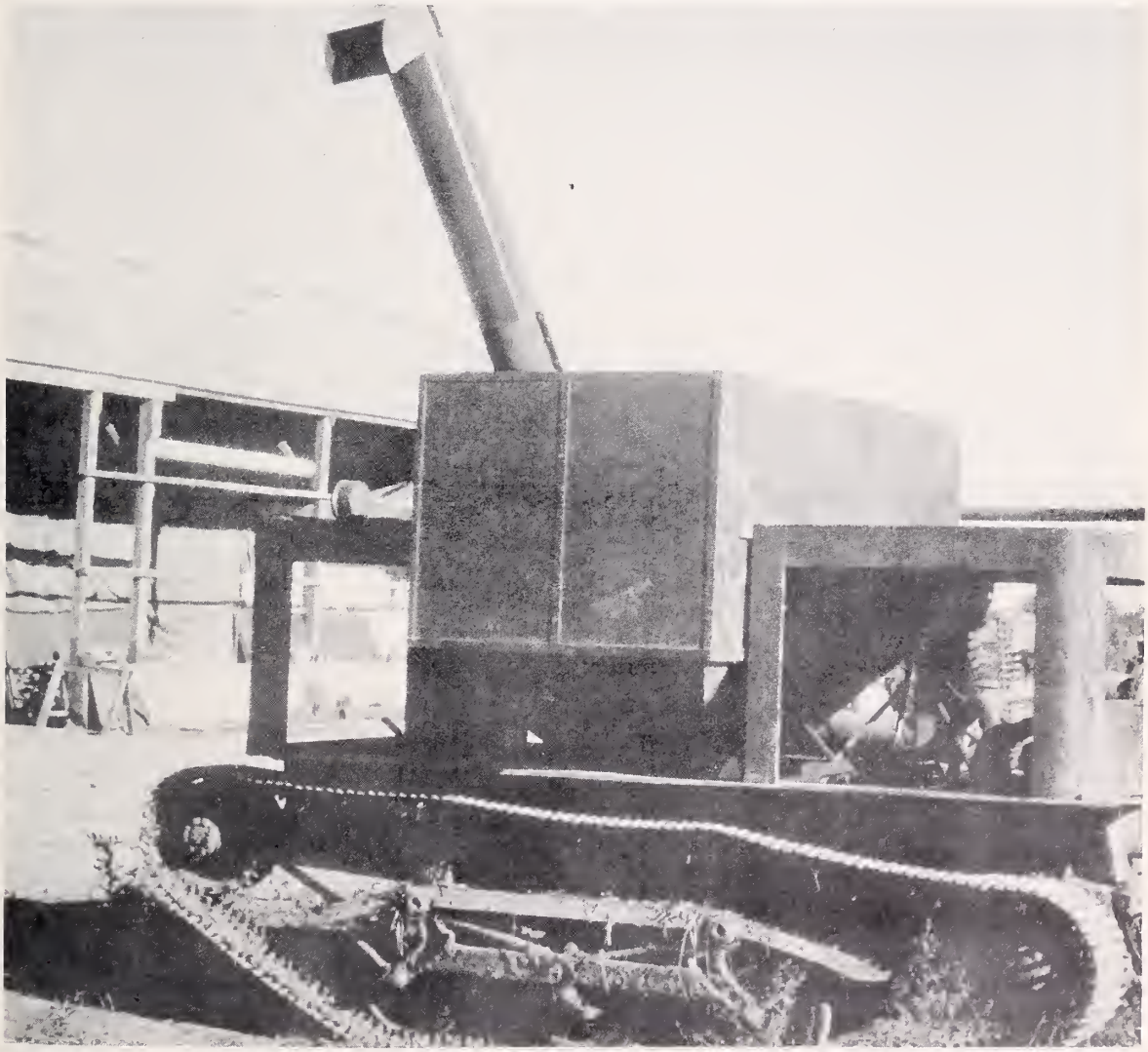

FIGURE 21. A self-propelled bulk-rice wagon used for moving freshly threshed rice from the combine to the dryer on an Argentine rice farm.

FIGURE 22. Baling rice straw in Argentina. Much of the rice straw is baled and shipped to nearby pulp mills for manufacture into paper.

FIGURE 23. Rough rice is transported to assembling points by primitive methods.

The rice varieties grown under upland conditions in Panama, mostly mixed Fortuna and Honduras, have not proved to be well adapted to mechanized farming. Thus, for the 1949 crop, 1,200 sacks (100 pounds) of rice seed of the Rexora, Bluebonnet, Zenith, Magnolia, and LaCrosse varieties were imported from the United States. Indications during the early part of the growing season show that Rexora and Zenith may be well adapted to this type of culture. Nira has also been tried recently; it produces a good yield of high-quality rice under conditions prevailing in Panama but lodges badly, and thus is difficult to harvest with combines.

Outlook

The difficulties experienced in cultivating rice in Panama by the mechanical production methods used in the United States indicate that progress in that type of production may be slow. Because of adverse weather conditions, the rolling-to-hilly topography of the land, and the shortage of water for artificial irrigation, it appears that competition with other mechanized areas (United States and Brazil), where conditions are more favorable to the operation of machines will be difficult. The expansion of this type of production, however, is likely to continue until all domestic needs are met. The present Government program includes a tractor pool plan, the distribution of improved seed, and other measures designed to expand production to this level.

Bolivia

Bolivia appears to be a possible market for limited quantities of United States rice. Prewar imports of rice into Bolivia averaged about 20 million pounds of milled rice annually and in some years part of this volume was taken from the United States. The 1948 imports of about 20 million pounds came from Brazil, Argentina, Uruguay, Ecuador, and Chile. Until 1949 Bolivia in recent years has not imported rice from the United States reportedly because of American export restrictions under the allotment system of the International Emergency Food Council.

Total rice requirements for Bolivia are estimated at from 40 to 45 million pounds a year--the per capita consumption averages about 11 pounds annually. Domestic production of milled rice in recent years has averaged about 25 million pounds, leaving a normal import requirement of from 15 to 20 million pounds. Bolivian rice consumers do not demand a high-quality, long-grain rice. Dealers report that medium-grain rice with a broken grain content of up to 30 percent, and with up to 2 percent spotted grains, will move reasonably well at current prices. Under 1949 conditions, the c.i.f. price at Arica for this quality rice is reported to be from $8.00 to $9.00 per 100 pounds. Retail ceiling prices in consuming centers were around 14 cents per pound in June 1949.

About 70 percent of the rice produced in Bolivia is grown in the Department of Santa Cruz, and the remainder is produced in Beni, Pando, and the Chaparo region of Cochabamba. Most of this rice is consumed in the rural areas where produced. Transportation difficulties from these

relatively remote areas to the larger consuming centers are such that the major cities are likely to continue to need import supplies. The domestic rice is usually hand-pounded on the farms where produced, and the surplus production moves to nearby small mills to be hulled, but not polished, for local consumption.

Canada

Canada's 1948 imports of rough and milled rice totaled 60.2 million pounds as compared with 57.4 in the year before and 70.9 million pounds annually in the prewar (1936-40) period. All 1948 imports were of United States origin. Of the total, 99 percent was rough rice and 1 percent was cleaned rice. Imports from January to June 1949 were 39.1 million pounds, mostly in the form of rough rice as compared with 33.1 for the same period in 1948.

Since January 1, 1944, the United States has been the only country from which Canada has imported rice. The imports during the 5 years 1944-48 averaged 53.3 million pounds--50 million of rough rice and 3.3 million pounds of cleaned.

Before the war, Canada received about one-fourth of its rice imports from the United States. The principal countries of origin in the 1936-40 period, other than the United States, were British India and Burma, Hong Kong, and Japan. In some years, important quantities were also obtained from Egypt, Siam, and Australia. During the first part of the war, Mexico and Brazil were sources of rice for Canada.

With increasing world supplies of rice and the termination of world export controls, the United States rice industry should expect increasing competition from other supplying areas for its rice markets in Canada. If, however, per capita rice consumption in Canada rises to prewar levels the current volume of shipments from the United States to Canada of about 50 million pounds annually should continue.

SELF-SUFFICIENT RICE REGIONS

Chile, Peru, and Argentina are the most important rice-producing countries of the Western Hemisphere, which are now self-sufficient in rice. Others that shift position from year to year, depending upon weather conditions and other factors, include some of the countries of Central America and the Caribbean area.

Argentina, Chile, and Peru were important importers of rice in the prewar period, taking a combined volume averaging 120 million pounds annually in the 1936-40 period. During the war production expanded to the point that all domestic needs were met, and none of these countries is likely to resume a position as a market for foreign rice. Chile actually expanded output to become an important exporter from 1943 to 1947 but, due to increasing costs and declining yields, has reduced production to domestic consumption levels. Both Argentina and Peru could consume more rice than is now being produced domestically but, because of foreign-exchange difficulties and domestic food programs aimed towards self-sufficiency, they are not expected to import a large quantity of rice.

Practically all of the rice produced in these three countries if of the medium- and short-grain type. If any of these areas become rice exporters in the future, such competition will be restricted to the short-grain types. None of these countries has a marked consumer preference for long-grain rice. If they become importers, the market will most lilely be for short-grain, medium-quality rice.

Chile

In the prewar (1936-40) period, Chile was a heavy importer of rice, its imports averaging about 24 million pounds annually. During the war, production expanded and the country became an important exporter. Exports in 1945 rose to more than 91 million pounds. Chile increased rice production more rapidly than any other major area in the Western Hemisphere from the prewar (1936-40) period to the last year of World War II. Since the peak harvest of 1945, production has declined to the point that the 1949 crop is expected to be about sufficient for domestic needs.

Chile is not likely to again become an importer of rice. The country has a shortage of foreign exchange, and its ability to produce rice has been clearly demonstrated. On the other hand, several factors indicate that Chile may not maintain its wartime position as an exporter of rice. Yields per acre have been declining, world prices are lower, and internal costs of production have increased. In addition, prices fixed by the Government are relatively less favorable for rice than for other crops, and lower profits may prevent a speculative expansion. Prospects for the Next 5 years, therefore, indicate that the production will be about equal to domestic needs and that only a small volume will be exported when per acre yields are above average.

Production, Consumption, and Trade

The rice history of Chile in the last decade has been unusual. It provides a good illustration of the ease with which a country can go into or out of rice production in a relatively short period of time. Early in the 1930's, Chile produced practically no rice. About 10 years later, almost 120,000 acres were planted and more than 7,350,000 bushels of rough rice were harvested. Whereas around 33,000,000 pounds in terms of milled rice were imported annually in the 1933-37 period, more than 91,000,000 pounds were exported in 1944-45. Since that year of peak production, the crop has declined with almost equal rapidity. Production in 1948-49 is about half that of only 5 years ago (table 22).

The expansion from 1933 to 1944 resulted from a combination of factors. In the early days of the depression, Chilean businessmen began to look for other sources of foreign exchange when exports of nitrate of soda and copper declined. They began to experiment with rice because there appeared to be a profitable export market. About that time, they developed irrigation methods whereby the cold water from the mountain streams could be warmed by holding it in shallow canals and fields. In

this way, relatively high rice yields were obtained from medium-early varieties. Thus, rice production on a commercial basis began as an experiment by large landowners.

TABLE 22.- *Chile: Rice acreage, production, and trade, annual 1933-34 to 1948-49*

YEAR	PLANTED ACREAGE	YIELD PER ACRE	PRODUCTION		IMPORTS 1/	EXPORTS 1/
			Rough	In terms of milled		
	1,000 acres	*Bushels*	*1,000 bushels*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
1933-34	185	81.1	15	439	33,997	-
1934-35	277	86.6	24	702	30,631	-
1935-36	492	99.6	49	1,433	35,562	-
1936-37	2,718	62.9	171	5,002	39,226	-
1937-38	10,119	65.3	661	19,334	26,751	-
1938-39	20,485	79.1	1,620	47,385	18,576	-
1939-40	32,820	79.1	2,595	75,904	880	-
1940-41	32,017	68.9	2,206	64,526	159	8,598
1941-42	38,115	78.9	3,008	87,984	-	18,635
1942-43	71,155	75.1	5,341	156,224	-	50,715
1943-44	90,856	81.4	7,395	216,304	-	61,134
1944-45	109,505	71.8	7,862	229,963	-	91,700
1945-46	118,522	48.8	5,778	169,007	-	74,088
1946-47	79,539	53.7	4,274	125,014	-	5,952
1947-48	69,702	62.9	4,381	128,144	-	1,252
1948-49	60,105	67.1	4,035	118,024	-	-

[1] In terms of milled rice and for the calendar year following planting.

Compiled from records at the Office of Agricultural Attache, American Embassy, Santiago.

The most rapid large-scale expansion took place between 1940 and 1945. Higher prices caused by the reduction of exports from Asia made rice a profitable export crop. Due to the scarcity of milling facilities and dryers, however, it still remained a crop for the "big farmer." About 95 percent of the 1942-43 harvest was produced by 130 growers, and the indications are that this is true for most of the 1948-49 crop. Prices were favorable for production from 1940 to 1945 and yields per acre were unusually high during these first years when the crop was planted on virgin land. Rice growing became something of a fad, and businessmen started renting and planting land as a speculative venture.

Production began to decline rapidly after 1945. The most important reason appears to be a decline in yields. While Chile's average per acre yields varied from 70 to 80 bushels of rough rice in the seven seasons before 1945-46, the average yield that year was less than 50 bushels per acre. Since much of the crop was financed and produced by a relatively few businessmen, their costs were too high to make a profit on lower yields. Per acre yields since 1945-46 have remained much lower than before. More rencently, the Chilean Government established guaranteed minimum prices for certain other crops, which tended to hold rice production down. Thus, although world rice prices continued to increase until 1948, Chilean production declined, and it now barely supplies domestic requirements.

The per capita consumption of rice in both Chile and Peru is around 20 pounds per year. The annual consumption therefore is about 110 million pounds of milled rice. This is the equivalent of about 3,900,000 bushels of rough rice, including annual seed requirements. Rice and beans are reported to be the major items in the diet of low-income familes, and the two foods tend to interchange or to compete, depending on relative prices. The established price for rice of the "common" type in June 1949 was somewhat above the comparable price for beans; if this should continue, the per capita consumption of rice might decline. Over a period of years, however, the per capita consumption of rice is not expected to decrease, as the cost of bean production is likely to rise and fall with the cost of rice production.

Milling and Marketing

The average percentage of products obtained per unit of rough rice milled are: Head rice, 45 percent; broken rice, 20 percent; brewers grains, 2 percent; and bran, 9 percent. The 24 percent of hulls and waste is normally used for fuel in operating the mills. Since the industry is of comparatively recent origin, most of the 21 commercial rice mills have relatively new and efficient milling machinery that was obtained during the early years of the war, and it appears to be similar to rice-milling machinery used in various parts of the world. The rice produced in these mills was good quality, medium grain; and, except for a higher-than-average breakage, it would meet the standards of most importing countries of the world. This breakage is caused by that portion that is too high in moisture content and by a wide variation in the size and type of grain in any given lot.

Millers report that about a sixth of the rough-rice harvest contains 15 percent of moisture; a sixth, 16 percent; nearly a third, 17 percent; a fifth, 18 percent; and a fifth has a moisture content varying from 19 to 30 percent. They report that rough rice with a moisture content of less than 17 percent will keep satisfactorily and produce a reasonably good milled product, but that 40 percent of the crop has a moisture content higher than 17 percent and must be dried before storing. Even after drying, this rice is low in quality because of deterioration between the time it was threshed and the time it was dried at the mill.

Practically all of the rice production is financed by 20 large milling companies. These mills advance seed to the growers and lend them from $25 to $30 per acre for producing the crop. They employ field men to supervise the use of their money in growing rice and to see that the harvest moves to the mills. These millers point out that the current domestic price of rice is now slightly above the world price and that, with increasing costs and lower yields per acre, Chile is unlikely to regain its export position as long as these circumstances prevail.

By Government order, the mills produce and market only two grades of rice--"common" and "extra fine." The common grade has a permitted tolerance of broken grains up to 35 percent, while the extra-fine grade has a requirement of 10 percent or less broken grains. In 1948, only

one grade was allowed with a maximum tolerance of 25 percent in broken grains. Government officials reported that it has been necessary to restrict the milled product to only one or two grades in order to enforce price-ceiling regulations. They reported that in earlier years when they placed ceiling prices on a large number of different grades, somehow only the higher-priced grades were available to consumers. With the increasing supplies of rice and the declining prices, however, in the near future they expect to revert to the standard Government grades used in earlier years.

These standard grades are as follows:

1. "Extra Fancy," with a maximum tolerance of 5 percent broken grains, 3 percent dark or spotted grains, and 0.5 percent impurities.

2. "Superior," with a maximum tolerance of 20 percent broken grains, 5 percent dark or spotted grains, and 0.5 percent impurities.

3. "First Grade," with a tolerance of 40 percent broken grains and with 15 percent tips, 15 percent dark or spotted grains, and 1 percent impurities.

Under the standard marketing procedure, the millers purchase the rough rice immediately after it is harvested, pay the Government-fixed minimum prices, and then dry the rice before storage. Since there is practically no rough-rice storage capacity on the farms, the mills must purchase and store sufficient rough rice in the 2-month harvesting season to maintain their volume for the entire milling season. Thus, the mills all have large rough-rice warehouses in connection with their milling unit. The rice is stored in sacks in flat warehouses and milled as orders are received.

In 1947, a group of Chilean rice mills organized a cooperative company for the purpose of constructing a mill to extract oil from rice bran. This mill began to operate in 1948 and, although certain operational difficulties have been reported, it is expected to alleviate the fats and oil shortage of Chile in the future. Oil has been successfully extracted from rice bran since the early 1930's in Japan, and several plants have recently been built in the United States. The Chilean plant, apparently using a solvent process similar to that in Japan, is the first one reported in South America. Most of the rice bran in Chile, however, is used as livestock feed. In this country, as well as most of the other countries of Latin America, rice bran is the only byproduct feed that is produced.

Prices

The price for rough rice of the 1948-49 crop was fixed by the Government at about $1.75 per bushel, or $6 per barrel, delivered at local railway stations. Since all of the production is of a medium-grain

type similar to Early Prolific or Zenith, there were no price variations for different types of rough rice. Deductions were provided, however, for all rice that did not meet minimum specifications, which in most cases were 16 percent moisture and 5 percent impurities. These adjustments were made at the rate of 1 percent of the price for each 1 percent of impurities above the maximum allowed, and a reduction in price of 1 percent was made for each 1 percent of moisture between 16 and 18 percent and a reduction of 1.5 percent of the basic price was made for each 1 percent of moisture above 18 percent.

The wholesale controlled prices for milled rice of the 1948-49 crop were equivalent to $8.00 per 100 pounds ofr the "common" grade containing 35 percent brokens and $11.00 per 100 for the "extra fine" grade, containing 10 percent broken grains. The fixed retail prices were 9 and 14 cents per pound, respectively. Retail prices for the preceding year varied from 8 to 13 cents. Byproduct controlled prices for the 1948-49 season ranged from about $5.00 per 100 pounds for brewers rice to $1.50 per 100 pounds for rice bran.

Production Methods

Chile's rice area is located in the central valley south of Santiago. A small amount of rain falls in the valley during the winter months but practically none falls during the spring and summer growing season (October to March). Therefore the water for irrigation is from rapid mountain streams and is unusually cold. Sometimes it is held in the sun in shallow canals or open, diked fields before it is used to flood the fields.

With fairly low temperatures in the winter months (April to September), the growing season for rice appears to be restricted to a maximum of about 160 days. The 120-day varieties are preferred, since they can be easily havested before the winter rains. The crop is seeded in October and November and harvested in February and March. Although there appear to be no pure-line varieties, and there is variation in size and type of grain in the samples that were examined, Chilean rice is a medium-grain type. The varieties that were found to be best adapted were the Early Prolific and Blue Rose.

Most of the rice is produced by on-farm hired laborers who are paid a straight daily wage plus a small share of the crop. No established rotation is in use. The land is usually plowed in the winter or early spring and harrowed just before planting. About 70 percent of the planted area is plowed with oxen teams and mouldboard plows, while the remaining 30 percent is plowed with tractors, primarily disk plows. Nearly all the harrowing is done with spike-tooth harrows drawn by oxen. When rice was first grown in Chile, most of the crop was seeded in nursery plots. About 12 bushels per acre was seeded, which produced enough plants to transplant 35 acres. In recent years, however, as a result of a larger planted area and the high cost of labor, farmers have shifted to broadcasting, and less than 10 percent of the 1948-49 crop was transplanted. The seeding practice now is to flood just before

planting, harrow the flooded fields, and broadcast presoaked seed by hand in the puddled fields. Some producers report that they plant 3 bushels, and others use as much as 4 bushels per acre, so that a dense stand will partly crowd out the weeds.

The field is "given a bath" after planting by being flooded to a depth of from 1-1/2 to 2 inches, then drained after a day or two to let the soil warm up. After a good stand is obtained, more water is added, and six to eight inches of water is left on the fields from about December 1 until late February or March. The water is drained off 2 to 3 weeks before harvesting. Some producers drain the field once or twice during the growing season to "let the rice plants warm up a bit." The levees, in most cases made by hand, are usually built or rebuilt just before the land is flooded for planting. They are mainly of the contour type, but are narrow and steep.

The crop is cut by hand, shocked and left in the fields to dry for a week to 10 days. It is then threshed in stationary threshing machines, which in most cases are operated by tractor power. The farmers do not have dryers, and, if rice is threshed wet, it is dried as a part of the milling operation after it reaches the mill. No rice is stored on farms, and in a 6-week harvesting period the miller usually must take in all of the rough rice that he expects to mill during the season and provide storage space for it.

The rapid decline in the average yield per acre since 1945, together with the accompanying factors has caused the leaders of the rice industry much concern. The major reasons for this situation appear to be: (1) A decline in the fertility of virgin land resulting from repeated use of the same crop without fertilizers; (2) infestation of the land with weeds that are water-tolerant, practically impossible to eradicate, and that continue to increase on land where rice is produced for several successive years; (3) a gradual deterioration of original seed stock, and an increasing contamination of red rice in the seed and the soil; and (4) a lack of fertilizers. The weed problem could be solved in time by proper rotations, improved irrigation, and chemical weed-control methods. New varieties could be introduced and pure lines of seed could be maintained on clean land. With controlled irrigation, fertilizer applications would probably be more effective. All of these developments, however, are likely to be slow in a declining price period.

Outlook

Chile has sufficient water and land to maintain a production level on a reasonably efficient basis. Although the average yields per acre have declined, they are higher than those of the United States. Climatic conditions, however, restrict production to medium- and short-grain types, and weed control and other production problems are apt to retard a gain in output. In addition to this, other crops compete for the land and water.

The above factors indicate that little rice will be exported from Chile in the next few years. Fluctuations in prices of competing crops

and new developments in the production methods of Chile could change this situation.

Peru

Peru probably will not be in the market for any large quantity of United States rice in the near future. Domestic production is indicated to be sufficient to meet local needs in most years. In years when inadequate water supplies cause a decrease in production, rice shortages are likely to occur within the country. In this event in the next few years a lack of foreign exchange, especially of dollars, is likely to retard the imports of rice. If any imports are arranged, they probably will consist of relatively small quantities from nearby Ecuador.

Peru could become an exporter of rice, but this does not appear likely in the near future although it might be possible within 10 years. Much of the 320,000 acres now planted to cotton and the 125,000 acres planted to sugarcane could be shifted to rice. If the price of cotton and sugar were to decline, a change-over to rice as an export crop could develop. Because of transportation difficulties, climatic factors, and population trends, development of this area will be slow and it is not to be expected in the immediate future.

Production, Consumption, and Trade

The data in table 23 indicate that unlike the situation in Chile, rice has been an important crop in Peru for at least 30 years. While the planted acreage increased about 70 percent from the 1920-24 period to that of 1940-44, in recent years it has been fairly stable or near the 1940-44 average of 130,000 acres. Trends in yields, however, have been spectacular. Whereas the per acre yields in Chile declined, in Peru they increased markedly. The yield in 1920-24 was about 34 bushels, or 9 barrels, per acre. It increased steadily until it averaged 50 bushels, or 14 barrels, in the 1940-44 period, and more than 65 bushels, or 18 barrels, per acre in the 1945-49 period.

The reasons for this increase in yields per acre appear to be related to the importance of the crop. Rice has become a source of cash income on farms in some of the coastal areas of Peru, and changes in production practices have accompanied the shift of rice from a minor food to a major cash crop. Whereas, rice was formerly produced in small plots under relatively primitive conditions, it now is cultivated in large areas with the same attention as cotton and sugar. An important change accompanying the increase in rice acreage was the shift away from broadcasting to hand transplanting methods. Less than half of the crop in prewar years was transplanted, but in recent years at least 85 percent has been produced in this manner. The proportion varies from year to year, depending on the time that water becomes available. In the 1949 planting season, water for irrigation became available so late that a larger part than usual was seeded by direct broadcasting. In the leading rice area of Peru, the Department of Lambayeque, about 20 percent of the

45,000 acres planted to rice was broadcast directly and 80 percent was transplanted. This ratio was reported to be about the same in the other valleys.

TABLE 23.- *Peru: Rice acreage and production, averages 1920-44, annual 1945-49*

YEAR	SEEDED ACREAGE	YIELD PER ACRE	PRODUCTION 1/	
			Rough	In Terms of Milled
	1,000 acres	*Bushels*	*1,000 bushels*	*1,000 pounds*
Average:				
1920-24.....	77	32.1	2,474	72,311
1925-29.....	82	28.4	2,332	68,122
1930-34.....	125	38.2	4,781	139,772
1935-39.....	106	38.0	4,027	117,726
1940-44.....	131	49.3	6,452	188,493
Annual:				
1945.....	147	53.1	7,810	230,775
1946.....	126	74.7	9,409	278,432
1947.....	114	63.7	7,261	217,839
1948.....	132	76.8	10,132	303,964
1949 2/.....	94	68.3	6,423	192,682

1/ Does not include 5 percent of the crop used for seed.

2/ Preliminary.

Compiled from records of the Office of Agricultural Attache, American Embassy, Lima, and other sources.

Other important factors in the increase of per acre yields are: (1) An efficient use of the available water supply by the construction of levees on the contour rather than in small, rectangular plots, (2) greater efficiency with the use of tractors in plowing and fitting, (3) an increased use of fertilizer, and (4) better harvesting methods, including the use of the threshing machine to replace hand-threshing and oxen-threshing methods. Although cut by hand, about 70 percent of the crop is now threshed with modern machinery.

Peru's per capita consumption of milled rice has ranged from 20 to 25 pounds annually during most of the past 30 years (table 24). The small variation from year to year indicates that if supplies are available this rate is likely to continue. The annual consumption of milled rice is estimated at about 245 million pounds, and domestic production was sufficient to meet this need in 1948.

Peru imported fairly large quantities of rice in some years of the prewar period. Milled rice imports amounted to about 23 million pounds in 1937 and to 46 million pounds in 1939 but declined during the war when supplies were difficult to obtain (table 25). Imports in 1945, however, amounted to about 29 million pounds, largely because of the low domestic production of the preceding year. Imports have come from a number of sources, with Siam the principal supplier before the war and Ecuador in 1945.

A shortage or rice similar to that which developed in 1945 may be in prospect for Peru in late 1949 and early 1950. A recent unofficial estimate places the 1949 plantings at 94,000 acres and the crop at 6,400,000 bushels of rough rice (193 million pounds in terms of milled).

TABLE 24.- *Peru: Milled rice consumption in selected years, 1917 to 1947*

YEAR	DISAPPEARANCE	POPULATION	PER CAPITA
	1,000 pounds	*Million*	*Pounds*
1917	95,029	4.2	23
1921	103,396	4.5	23
1925	125,479	4.8	26
1929	154,558	5.1	31
1933	115,779	5.5	22
1937	113,707	5.9	20
1939	173,914	6.1	29
1941	229,979	6.3	36
1943	179,591	6.6	27
1945	259,041	6.8	38
1947	217,841	7.1	31

Compiled from records of the Office of Agricultural Attache, American Embassy, Lima, and other sources.

This is 55 million pounds of milled rice less than the normal consumption requirement of 245 million pounds. This means Peru will have to import additional supplies in late 1949 and early 1950 or reduce consumption to about three-fourths of the average. In view of the wide difference between the domestic price of rice and the prospective price of imported supplies, it would appear doubtful that the country will import rice.

TABLE 25.- *Rice (milled) imports in selected years, 1937-47*

SOURCE	1937	1939	1941	1943	1945	1947
	1,000 pounds	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*	*1,000 pounds*
Brazil	280	990	6,339	1,382	710	1/
China	997	45	9	0	0	0
Ecuador	576	9,734	1,379	3,336	15,954	1/
United States	112	220	4	0	0	1/
Hong Kong	4,926	14	0	0	0	0
India	815	333	0	0	0	0
Japan	43	51	8	0	0	0
Siam	14,763	34,745	0	0	0	0
Chile	0	44	51	0	11,601	0
Others	320	65	0	0	0	0
TOTAL	22,832	46,241	7,790	4,718	28,265	1/

1/ Less than 500 pounds.
Compiled from records of the Office of Agricultural Attache, American Embassy, Lima, SCIPA, and other sources.

Milling and Marketing

The rice marketing industry of Peru was under rigid Government control. Fixed prices to producers were set annually for rough rice. The producers were required to deliver the rough rice to designated mills before payment was made. These mills dried, stored, and milled the rice for the Government on a fixed-fee toll basis, and the milled rice was sent

to designated wholesalers at a controlled price. The wholesalers, in turn, had a fixed sales margin and retailers were required to sell at a fixed retail price.

The Government paid the miller as the operating toll the equivalent of 8 cents per 100 pounds of milled rice, including all broken rice. All byproducts became the property of the miller. The miller, however, sold the producer the equivalent of 3 percent of the rough-rice weight in rice bran at a fixed price of 53 cents per 100 pounds. In addition, the miller milled a fixed percentage of the milled product for each unit of rough rice delivered to him. This percentage varied from 57 percent in the southern rice area, where rough rice in considered to have a poorer milling quality, to 66 percent in the important northern region. Under such an arrangement, any milled rice produced above these requirements becomes an "overrun" and is the property of the miller. Thus the income of the rice miller comes from three sources: (1) The toll fee for drying, storing, and milling; (2) the sale of brewers rice and rice bran; and (3) the sale of the "overrun" of milled rice above Government yield standards.

Two grades were being produced: "Corriente," containing not more than 35 percent broken grains, and "Extra," containing not more than 25 percent brokens. Most of the milled product is of the "Corriente" grade, since to mill this grade, the miller has only to run the rice through a huller and polisher and then sack it, without having to separate and remix it. Average milling percentages in the southern Camana area were reported to be 63 percent salable rice of the "Corriente" grade, 1 percent small brokens, and 7 percent bran. In the more important Chiclayo area, they were reported to be about 66 percent "Corriente" grade milled rice, 1 percent brokens, and 6 percent bran.

Prices

Rough-rice prices for the 1949 crop were announced on May 20, 1949, for the major part of the crop, which is harvested and threshed from May to September. These prices are authorized by agencies representing the Government, which, in most cases are the local banks. The basic price for 1949 was set at 83 cents per bushel, or $3.00 per barrel, of rough rice.

The controlled 1949 wholesale price for milled rice was the equivalent of about $2.25 per 100 pounds for the "Corriente" grade of medium-grain rice, undermilled, with about 35 percent brokens, and $2.75 per 100 for the "extra" grade, also undermilled, but containing not more than 25 percent broken grains. The retail prices for these two grades varied from 2-1/2 to 3 cents per pound.

Rice prices in Peru were lower in 1949 than in any other country of the Western Hemisphere and were about as low as in any country of Asia. This apparently was due to a program of rigid Government controls maintained from the beginning of the war through 1949, which has held domestic prices and wage rates near prewar levels. Such a price structure makes it difficult for Peru to import rice from other countries. To

FIGURE 24. A rice dryer in Argentina. Most of the Rice of Southern Brazil and of Argentina is dried in on-farm rice dryers, which use wood for fuel.

FIGURE 25. Drying rough rice in southern Peru.

FIGURE 26. Stirring freshly combined rice to facilitate drying on an open-air concrete floor in Colombia.

FIGURE 27. Sacking dried rough rice in British Guiana.

purchase foreign rice would require Government subsidization of about 4 cents a pound, since the lowest quoted world price for the quality produced in Peru in mid-1949 was about 7 cents a pound.

Production Methods

Peru's rice is produced largely in the northern valleys along the seacost (fig. 15). Production is centered in the region of Pacasmayo, Chiclayo, and Piura, which produce about 85 percent of the total crop. Here the rice is usually seeded in December and January and transplanted in January and February. The crop is cut and stacked in June and July, and threshing continues from late June to early September. Since the region has no rainfall, the timing of the crop depends upon when the water supply from the rains and snow of the mountains becomes available.

About 10 percent of the crop is produced in the Department of Arequipa, which is near the southern border of Peru. In this region the crop is about 3 months earlier; it is seeded in October and November, transplanted in November and December, and harvested in May. The remainder is produced in small valleys along the coast with the exception of a small amount of jungle rice grown east of the Andes and some dryland rice that is raised in the foothills. The total area of these types is estimated to be only 1,200 acres, or less than 1 percent of the normal acreage.

As indicated previously, about 85 percent of the crop is transplanted and about 15 percent is broadcast directly. In the major area of the north about 600 pounds of seed rice per acre usually are planted in the nursery bed. One acre of seedlings from the nursery produces enough plants to transplant nearly 5 acres in the field. This means a seed requirement of 125 pounds (2.8 bushels) per acre for transplanting. The plants are set with about three plants per hill, with a distance of 6 inches between hills. In broadcasting, about 120 pounds (2.9 bushels) of seed is used per acre.

There are no established crop rotations. As in Chile, Peruvian rice usually is planted on the same fields from year to year, and if water is sufficient the field is plowed after the rice has been harvested and a crop of beans or corn is grown in the dry season. Yields per acre are increased, however, by a relatively heavy application of fertilizer. The native Peruvian "guano" is the fertilizer most frequently used, and an average of 450 pounds per acre is applied. In addition, some nitrate of soda is used in top-dressing, and some producers are now using ammonium sulphate in the irrigation water just after planting or transplanting.

Water usually is held on the growing rice constantly until just before harvest. The crop is hand weeded (fig. 10) and occasionally must be guarded against bird damage during the growing season. The varieties grown are mostly of the medium-grain type similar to our Early Prolific and Blue Rose, and they have a growing season of from 120 to 150 days.

The crop in the largest rice area is cut by hand, and the stalks are bundled and hauled by hand or on burro to a central location in the

field. Then they are piled in large cylindrical or square stacks which sometimes are 50 feet across and 12 to 15 feet high (fig. 20). Since it never rains in the eastern area, threshing is done more leisurely than in most countries. The rice is threshed as threshing machines become available, and the operation continues over a period of 3 months.

Although about 70 percent of the crop is threshed with machinery, the crop is threshed mostly by hand on the fringes of the northern area and in the southern area. Here the crop is cut and hauled immediately to a level clearing in the field where it is threshed. The rough rice is beaten with a stick or trampled by horses or oxen on a circular "threshing floor." Rice threshed by this method is usually too wet to store safely and the mills have open-air floors (fig. 25) where the rice is spread to dry and exposed to the sun for several days. It is turned each day until the moisture content is reduced to a reasonably satisfactory level.

The most unusual feature of Peru's rice production is the large part of the crop that is transplanted and the continuing trend in this direction. Peru is the only country in South America in which a large part of the crop is planted in this way, and its predominance is attributed to three important factors:

1. The population in the coastal valleys of Peru is relatively dense. On the other hand, good land with water for irrigation is scarce. Since hand-transplanted rice produces considerably higher yields per acre than broadcast rice, transplanting has become general in this area;

2. A proportion of the crop is grown on highly alkaline soils on which the plants will not develop unless the water supply is abundant all of the time. On the soils of these areas, rice is transplanted because it will not develop when broadcast; and

3. The time that the water flow from the mountains becomes available lacks uniformity from year to year. There may be as much as 3 months' difference from season to season. Thus, by starting the crop in the relatively small nursery plots that require only a small amount of water compared with that needed where the fields are broadcast, the crop can be grown from 1 to 2 months in the nursery and transplanted to the fields immediately when water becomes available. In this respect, the Peruvian practice differs from that of Japan and China, where it is believed the crop must be transplanted on the 41st day after it is seeded.

Average labor requirements for producing rice, as published by the "Comite De Productores De Arroz" in Peru, are as follows:

Operation:	Hours per acre
Field preparation:	
Clearing land	24
Raking up trash	16
Burning	8
Preparing levees	52
Plowing	6
Harrowing	2
Leveling	8
Preparing roads and ditches	12
Flooding	8
Total field preparation	136
Planting:	
Preparation of seedbed	64
Seeding the nursery	60
Pulling plants	16
Transplanting	120
Total planting	260
Cultivation:	
Cleaning canals	8
Irrigating	34
Fertilizing	8
Weeding	80
Bird control	16
Total cultivation	146
Harvesting:	
Cutting	48
Binding (by hand)	40
Stacking	6
Gleaning	8
Guarding stacks	9
Threshing	24
Total harvesting	135
Total all operations	677

These requirements appear high in comparison with the man hours needed in the United States to produce a crop by mechanized methods, but they are actually relatively low when compared with the hand labor required to cultivate transplanted rice in Asia.

Outlook

The characteristics of Peru's rice industry are more like those in a large part of Asia than any other country in the Western Hemisphere, because most of the crop is hand transplanted. Because the amount of good land available for food crops is small in comparison with the population resources, the land area is the factor limiting producition rather than labor. Prices are lower than world levels, but incomes are low, making it difficult to import rice when supplies are not sufficient. Transportation is difficult due to the rugged terrain, and food shortages may exist in one part of the country while there are relatively abundant supplies in other areas. Peru, however, has adopted mechanized methods of land preparation and harvesting and has a more varied diet than most Asiatic areas, thus a rice shortage in any given year is not as serious as in Asia.

Because of the relatively low internal price level, Peru is not likely to import rice in shortage periods. Thus the United States and other areas that have available export supplies must look elsewhere for markets. Because of the limited land area available on which to grow rice, this country is not expected to produce a surplus above domestic needs and become an exporter. For the next few years, Peru probably will be a self-sufficient region in regard to rice. In some years, it may have shortages but not sufficiently great to warrant significant imports.

In the Amazon River area east of the Andies Mountains, Peru has a potential rice region that could make the country an important exporter. There is reported to be abundant supplies of land and water that could be used for this purpose. Most of the population is west of the mountain range, however, and transportation is difficult at best. For the next few years, this region cannot be expected to contribute materially to Peru's total rice supplies.

Argentina

Argentina offers little promise as a possible outlet for United States rice. This country in prewar years imported sizable quantities, including small amounts from the United States. During the war, however, rice production increased to the point that at the end of the war domestic supplies were almost sufficient to meet local needs. Since then, production has declined somewhat, and rice shortages have developed in the past two seasons during the month or two before the new crop was marketed. Because of foreign-exchange shortages and a policy of using available foreign credits for the purchase of machinery and manufactured goods, Argentina imported practically no rice from 1946 to 1949 and is not likely to in the near future. Rice is not an important food in Argentina, and it is probable that most of the earned foreign exchange will be used for the purchase of items other than rice.

There are some indications that Argentina may become an exporter of rice, although not in the immediate future. The country has sufficient fertile land that is now used for livestock farming, and its producers are experienced in mechanized, large-scale farming. Its rice industry with efficient mills and an unusually effective advertising program, is one of the most progressive in Latin America. Due to high labor costs and the restrictions and exchange difficulties encountered in importing labor-saving machinery the present production is hardly sufficient to meet the local rice needs, and it will not expand immediately to export levels. Over a long period of time, however, Argentina has the potential capacity to expand rice production. If price relationships shift to a degree that the product becomes more profitable than that now produced, the rice enterprise will expand to the point that exportable surpluses can be expected. Because of climatic factors this production would be limited to medium- and short-grain rice.

Production, Consumption, and Trade

Unofficial estimates of Argentina's rice crop in 1948-49 indicate that 5,880,000 bushels of rough rice were harvested from an area of 128,000 acres. Harvesting conditions in the major production areas were unusually favorable in 1949, and weather conditions permitted the harvest to extend through June, almost a full month beyond the usual harvesting period. The 1948-49 crop was about 30 percent lower than that of the peak production year, 1943-44, when 8.6 million bushels were harvested from 138,000 acres, but this crop was almost twice as large as the prewar

(1935-39) average of 52,000 acres and 3.1 million bushels annually.

The statistical history of the development of the Argentine rice industry indicates a series of adjustments over a period of years (table 26).

The first important change was a sudden shift from the importation of milled rice to the taking of rough rice. This occurred in 1931 and it was the result of a new Government policy that imposed restrictive duties on milled rice to foster the domestic milling industry. The change greatly stimulated the domestic industry, and, by 1935, the acreage and production increased to about five times the level of 1930. The next important change was a gradual reduction of imports. This began in 1937 and in recent years only insignificant quantities have been taken. In 1946, exports totaled 17 million pounds. The domestic crop has become fairly stabilized at a harvest of from 5,500,000 to 7,000,000 bushels from about 125,000 acres.

TABLE 26. - *Argentina: Rice acreage, production, and trade, annual 1929-30 to 1948-49*

YEAR	AREA PLANTED	PRODUCTION	Imports	
			Milled rice	Rough rice
	1,000 acres	*1,000 bushels rough*	*1,000 pounds*	*1,000 pounds*
1929-30	9	295	158,850	-
1930-31	9	258	116,182	-
1931-32	16	506	36,301	60,413
1932-33	33	1,152	8,856	134,375
1933-34	47	1,642	414	109,983
1934-35	38	1,710	46	126,568
1935-36	36	1,642	2,844	76,348
1936-37	41	1,867	6,579	108,017
1937-38	54	2,352	104	110,812
1938-39	82	4,945	4	67,913
1939-40	82	4,752	0	24,447
1940-41	75	2,743	4,491	8,139
1941-42	84	5,296	346	148
1942-43	103	4,852	444	-
1943-44	138	8,559	0	-
1944-45	128	6,807	13,098	-
1945-46	122	6,339	224	-
1946-47	122	5,928	(1)	(1)
1947-48	128	5,497	(1)	(1)
1948-49	128	5,879	(1)	(1)

[1] Not available.
Compiled from official statistics, except for 1948-49.

The average annual per capita consumption of rice in Argentina, which has remained fairly stable, is only from 10 to 12 pounds. This is from one-tenth to one-fifth as much rice as is consumed in most of the countries of South America. This low consumption is largely the result of the high per capita consumption of meat, which is from 225 to 250 pounds annually, or almost twice that of the United States. In Asia the farmer or laborer customarily carries a container of cooked rice to the field or to his job. In Argentina the worker carried from 2 to 4 pounds of fresh, raw meat, and at lunch time he builds a fire, sears the meat,

and eats it. Since Argentina's population has continued to increase, however, the total demand for rice has also increased. As a result, rice has become a relatively scarce commodity in the last 2 or 3 years. According to trade reports the 1947-48 crop was consumed in 10 months (May 1948 to February 1949), and rice supplies were not available to consumers during March and April. Because of Government restrictions on imports, rice has not been imported to relieve the situation and consumers have eaten more beef than rice.

Marketing and Milling

About 70 percent of the rice produced in Argentina is of the medium-grain type and 30 percent is short-grain rice. The long-grain production is insignificant. On farms, short-grain rice is usually called "Japanese," and the medium-grain is termed "Blue Rose." Upon examination of samples, however, each type appears to be a mixture of several varieties. There is considerable variation in the size and length of the grain of the "Blue Rose" as well as of the short-grain type. Milled short-grain is called "Glace" by distributors and consumers, and milled medium-grain is known as "Carolina" rice. Although consumers apparently prefer the medium-grain "Carolina," the trade reports that, due to the relative shortage or rice, consumers at the present time have little preference as long as they are able to buy rice. Long-grain rice is not consumed in Argentina.

Millers reported that the average milling percentages for short-grain Japanese rice were 62 percent whole grains, 9 percent brokens, and 8 percent bran; and for the medium-grain Blue Rose type, they were 60 percent whole grains, 8 percent brokens, and 8 percent bran. The whole-grain rice probably contains the usual 8- to 12-percent broken grains of larger sizes. Reportedly no general grades of milled rice are used by the trade in Argentina at the present time. Prior to the war, five major grade designations were used, depending on broken rice content and percentage of yellow grains, but in recent years rice sales have been made on the basis of specific broken-grain percentages.

Much of the rough rice produced is heavily infested with red grains. At one large mill in Buenos Aires the rough rice being milled contained about 15 percent red grains, and this was reported to be typical. In this mill, one of the best in Argentina, the final product contained only a trace of red, striped grains. This product was obtained by careful milling, including 3 runs through the polishers. The mill had a capacity of 11,000 pounds of rough rice per hour. It was operated with German-type machinery, which was old, but short-grain and medium-grain rice of good quality was produced.

The standard quality, packed in 110-pound paper bags and 154-pound jute bags, contained 20 percent broken grains. The mill also sold a luxury rice in a 2-pound pasteboard box, with a broken-grain percentage not to exceed 7 percent. It had efficient, automatic packaging machinery and used consumer-size containers. Costs of packaging in these 2-pound boxes, it was reported, were 3 cents per pound over the costs of putting the same product into 154-pound jute bags.

This mill, together sith 20 other rice mills now in operation in Argentina, was coating all the milled rice with a glucose-talc mixture. In the process, the liquid glucose solution and the powdered talc was placed by hand in small mixers, after the rice was milled and the broken grains were mixed in, but the product was uniformly coated and of good quality. The glucose-talc coating was reported to be necessary to the milling process. It was indicated that if not processed in this manner, the milled rice becomes chalky within 2 months and is more susceptible to insect damage.

Throughout the war years, rice marketing in Argentina was controlled by the Government through a program of fixed prices for rough rice and for milled rice, at both wholesale and retail levels. In contrast to some other Governments in Latin America, however, the Argentine Government did not go directly into the rice business to the extent of operating mills or selling rice. Recently, in mid-1949, retail and wholesale ceilings on milled rice were abolished, but minimum prices for rough rice were maintained. Under this new policy, the trade expects an expansion of rice production and an increased market for the milled product.

Rice milling and marketing in Argentina is characterized by a small number of fairly large, efficient milling and marketing firms. One of these firms, which owns three of the largest mills in the country and operates a large rice farm in the major production area, reports favorable results from an extensive advertising campaign to stimulate the consumption of rice. In addition to press and radio advertising, the firm has printed one of the most attractive recipe booklets observed anywhere in the world. This booklet, illustrated in colors, has been distributed in large numbers to the firm's wholesale outlets and requests for copies have been received form neighboring countries.

Most of the producers do not maintain storage sapce for rough rice on farms and usually sell it directly to millers upon harvesting and drying. This means that the mills must maintain warehouses large enough in size to store in a 2-month harvesting season all the rough rice milled in a year. Since the product stores better as rough than as milled rice, it is stored in flat warehouses in 220-pound jute sacks and milled only as orders for finished rice are received. A large milling company imports raw jute from Pakistan, and operates a jute sack manufacturing plant.

Prices

The official prices to producers in 1948 were fixed at $2.56 per bushel for short-grain rough rice and $2.68 per bushel for medium-grain. The official retail ceiling for milled rice of the one standard grade, containing about 20 percent broken grains, unpacked, was 12 cents per pound.

In 1949, at the beginning of the harvesting season, the Government changed this policy of fixed prices at all levels. The minimum price that millers were required to pay producers was established in April 1949 at $3.35 per 100 pounds for short-grain rough rice and $3.47 per

100 pounds for medium-grain rice. Wholesale and retail ceilings on the milled product were abolished, and retail prices rose to about 18 cents per pound for short-grain rice and 19 cents for medium-grain Blue Rose. The minimum ceilings on rough rice apparently were based on the results of a survey of production costs that was made by a well-organized rice producers' organization. The results of this survey, including a weighted average of the three major production areas, indicated that average costs of rough-rice production for the 1948-49 season were $3.23 per bushel. Producers reported that they could not hope to compete with Brazil on a cost basis so long as the high minimum-wage rates are maintained by the Government. Thus they expect a continued prohibition of rice imports into Argentina and believe this is the only way their market can be protected unless the internal wage-rage scale is reduced so that production costs can also be reduced.

Production Methods

Rice is cultivated in the Provinces of Entre Rios, Corrientes, Santa Fe, Salta, Tucuman, and Misiones. Most of the commerical crop is produced in the northwestern part of the country due west of the major commercial area of Brazil, Rio Grande do Sul. Rice specialists in Argentina, however, believe that early-maturing varieties can be grown in large, lowland areas south of Buenos Aires.

The planting season for rice begins in September, reaches its peak in October, and is completed in November. Harvesting usually begins in March and is completed by the end of April, although in some years it extends through May.

Practically all the crop is produced on a fairly large scale, and most of it is irrigated. Some upland rice is grown in an area in the extreme north that is adjacent to the upland rice region of Central Brazil, but this production is minor and has no commerical importance. The land usually is plowed with teams of horses. Three-to-five-horse teams are the custom, but occasionally there are as many as eight to a team. Some land is plowed with tractors and seeded with a grain drill. The usual spacing is 6 inches between the drills, although in some instances, the spacing is 4.7 inches. Average seeding rates are 2.4 bushels per acre. In regions where weeds are especially thick, or where some of the seed may be destroyed by birds, up to 3.6 bushels per acre are seeded.

When the crop is 4 to 6 inches high, it is flooded and kept covered with water until just before harvest. In the important commerical areas of north-central Argentina, the water for irrigation is obtained from nearby streams. It is lifted by elaborate pumping systems to higher levels than is customary in most parts of the world where surface water is used for irrigation. On one farm, the water from the river fronting the property was lifted 15 yards up to the main canal. On another, the rent paid by the operator for the land was double the usual rent in the area because the source of water was nearby and required only an 8-yard lift. In this area, the relative scarcity of water and the expense of

irrigation appear to limit the expansion of rice production. In the northwest, however, near the foothills of the Andes, gravity-flow irrigation systems are in general use. Although the land planted to rice usually is flat and laid out in large fields similar to those in the United States, the levees generally are 2 to 3 feet high. They are laid out on rectangular lines rather than on contours and are not constructed on gradual slopes. This system of rectangular levees is not conducive to the use of labor-saving machinery for efficient harvesting.

Most of the crop is harvested by methods used in Brazil. It is cut by hand, shocked in the field in shocks from 5 to 6 feet high, and then hauled to stationary machines for threshing. In some regions, however, combines and binders are used. One farm had five self-propelled, 12-foot, cutter-bar combines in operation. This farm, the largest and most highly mechanized rice farm in Argentina, used six self-propelled units on 3,000 acres. In addition, some of the crop was cut by hand. Due to the short harvesting season, it was believed one large self-propelled combine was necessary for each 250 to 300 acres harvested.

Whether rice is harvested by hand, binder, or combine, weather conditions necessitate the use of mechanical dryers (fig. 24) in order to remove the moisture for storage. This is the principal reason that most of the rice farms in Argentina are fairly large, varying from 250 to 1,250 acres annually. To grow rice there, one must have a dryer on the farm or available nearby. Consequently, the output must be sufficient to pay for the costs of maintaining a dryer. The rice taken from the field usually has a moisture content of 25 percent and this content must be reduced to about 15 percent for proper storage. The dryers, manufactured in Argentina, are of the upright type similar to those in Brazil, and use wood for fuel. There is a lack of cooperative drying facilities in Argentina probably because of the transitory nature of the rice enterprises there.

Practically all of the rice grown commercially in Argentina is produced by tenant farmers who lease good land where water is available for a 3- to 4-year period. The pumping equipment is moved to this lot, where levees, irrigation ditches, and drainage canals are built. When the typical "tar paper" houses for the laborers are moved in and the dryer is constructed, the grower is ready to produce the crop. Rice is grown continuously for 3 to 4 years, then when red rice and weed infestations make another rice crop unprofitable, the land is returned to the owner for use as pasture. The tenant farmers then move to another area and follow the same practice. These growers establish their own pumping and irrigation facilities and usually pay the rent for the land in cash. Current rental costs on an average are reported to be $12 per acre. Farmers are specialized, and their capital is invested in workstock, equipment, houses, and dryers to produce rice, and no capital is invested in the land. Fertilizers are not used and formal rotation practices are not followed. Some interest is apparent in the establishment of rice production on a more permanent basis, so as to save high costs of moving every 3 to 4 years and reduce costs of irrigation, but to date little has been done along this line. On one farm, a permanent system was planned,

based on a rotation of rice and alfalfa, with the alfalfa to be used to pasture beef cattle.

This farm provided a good illustration of the progress under way in farm mechanization. The producer had recently constructed an elaborate 20-foot, cutter bar, self-propelled rice combine similar to those used in California. He found that the combine worked just as efficiently in the field as the smaller types from the United States and cut a larger swath. However, because of the difficulty encountered in running tractors and tractor carts over the wet rice fields at harvesttime, the rice had to be transported from the combine to the dryer by slow-moving oxen teams. As a result, the combine was idle more than half of each working day. To solve this problem, the grower purchased several United States army-surplus tanks (fig. 21), removed the steel superstructure, and built a light metal hopper on the body. He now runs these converted tanks up to a combine and blows the rough rice from the bulk hopper on the combine into the hopper on the tank. He then transports the rice across a field in as much as 1 foot of water directly to the dryer, where it is dried and stored in bulk.

Because of import limitations on machinery and parts and a shortage of trained mechanics and operators, such mechanization is not usual in the rice areas of Argentina, but this example indicated the possibilities of the use of mechanical equipment in that country. In general, Argentina is the most highly mechanized agricultural country observed outside of the United States. There are about 35,000 tractors on the farms and Argentinians plan to double this number within 5 years if sufficient foreign exchange can be secured. This mechanization together with the large and fertile, level land areas now in pasture that could be planted to rice would indicate Argentina has a potential expansion of rice production.

Argentina was the first country outside of Asia in which general industrial use was made of rice straw. On many of the large farms, a hay baler (fig. 22) is run behind the combines to pick up the straw and bale it for transportation to nearby pulp mills, where the straw is processed into paper. Farmers were receiving about $5 per short ton for the straw in the field, and the contractor of the pulp mill performed all the work of baling and transporting. The delivered price at the pulp mills, where the producers operated their own balers and trucks, was $20 per ton. Average rice-straw yields were reported to be about 1,600 pounds per acre.

Outlook

Domestic rice supplies in Argentina from 1946 through 1949 were only about 80 percent of the effective demand. This was reportedly due to a Governmental policy of fixing ceiling prices on the product at a level that discouraged production. Recently, however, ceilings were eliminated for the milled product at the wholesale and retail level, and producer prices increased considerably.

FIGURE 28. Wooden "rice mill" in Cuba. This equipment is usually found on small farms.

FIGURE 29. Drying rice in the sun in Ecuador. Before hulling and cleaning in the mill, rice is emptied from the bags and spread in patios for complete drying.

FIGURE 30. Rice storage bin in Ecuador.

FIGURE 31. A rice marketplace in a village of central Colombia. In most of Latin America, milled rice is sold in bulk so that the purchaser can examine it.

Argentine growers report that rice production will increase if the new policy of fixing grower prices each year by an annual survey of production costs is continued. They report that under these conditions the crop can be expected to increase from 10 to 20 percent by 1951, and by an additional 10 to 20 percent the following year. When expansion to from 20 to 40 percent above the 1949 level is reached, producers expect all domestic needs will be met.

Because of high fixed labor costs, the rice industry sees little change of future export business in competition with Brazil. The members of the trade are confident, however, that despite the current shortage, the country will not again become an importer of rice.

If and when rice production expands in Argentina to permit export supplies, the product will be of quality similar to that now exported from Rio Grande do Sul in southern Brazil. The short growing season in Argentina also restricts the production to short- and medium-grain types. Since Argentina has an efficient milling industry and an enterprising merchandising program, when production is expanded to export levels, a high-quality, clean, attractive product will be placed on the market, which will be equal to the medium- and short-grain milled rice produced in the United States.

Guatemala

Guatemala has shifted from a prewar position as a minor importer to that of meeting domestic needs, with a small export surplus. Imports of milled rice in the 1936-40 period averaged 75,000 pounds annually; net exports in 1948 totaled 258,000 pounds. The planted area has increased from about 6,000 acres annually since the early 1930's to about 25,000 acres. The per capita consumption is estimated at 10 pounds annually.

Both unirrigated (upland) and irrigated rice are produced in Guatemala, but the former predominates. The crop is planted in May and June at the beginning of the rainy season and harvested in October and November. Cultural methods used by most growers are similar to those on the small farms of Panama. The crop is usually planted by hand on newly cleared, burned-over land. It is hand-weeded two or three times during the growing season although it is cultivated with plows. It is harvested by hand, dried at the farm home, and usually milled at home by hand-pounding. Milling percentages of milled rice are reported to be about 55 percent of rough rice.

SUMMARY AND CONCLUSIONS

The volume of rice exported from Western Hemisphere nations in 1948 was about four times the average export of the prewar (1936-40) period. The Western Hemisphere shifted from the prewar position as a net importer of about 500 million pounds of milled rice annually to a net exporter of about 1 billion pounds. Whereas, before the war, most of the imports originated in the surplus regions of Asia, in recent years, some of the Western Hemisphere surplus has been exported to the countries of Asia,

which became deficit during the war. Current indications are that some of these Asiatic markets are not likely to be maintained. With Western Hemisphere production at a high level and declining foreigh markets, the competition for rice markets in deficit countries of the Western Hemisphere is expected to be intensified.

The Western Hemisphere change-over from a prewar deficit to a major surplus-rice region has been due to a rapid expansion of acreage and production in the countries where rice is grown. The 1948 rice acreage of Sough America increased 81 percent over the 1935-39 level; that of Central America and the Carribean, 93 percent; and in the United States, 74 percent. The total acreage of the Western Hemisphere in the 1935-39 period represented about 2 percent of the world total and increased to only 3.6 percent in 1948. Exports, however, increased from slightly more than 2 percent in the prewar area to almost 20 percent of the 1948 world total.

There is little possibility that the Western Hemisphere will return to a prewar position as a net import area. There are some indications that the current high level of export supplies from countries other than the United States may not be maintained. Increased costs of production, declining prices in export markets, and a larger domestic consumption may cause a decline in the availability of the exporting countries.

Brazil, Ecuador, British Guiana, and Mexico are the most important exporting countries within the Hemisphere that compete with the United States. Although these countries, with the exception of Colombia, will continue to export rice, the export supplies are not expected to be as great in the next 5 years as from 1945 to 1948. Total rice exports from South America, Central America, and the Carribean are expected to more nearly approximate 500 million pounds annually rather than the 800 million pounds exported in 1948.

Our major competition for short-grain rice is in Brazil and British Guiana. Brazil produces high-quality rice of the short-grain type but because of domestic food needs, practically no exports have been shipped in 1949. This Brazilian trend towards decreasing exports and greater domestic consumption is expected to continue. British Guiana produces short-grain rice of medium quality and markets it as parboiled rice. Total production is expanding slowly and it will compete with United States rice in the British West Indian markets where parboiled rice is preferred.

Competition in long-grain rice appears likely to be more varied. The export supplies of Ecuador, Colombia, and Mexico are almost entirely of the long-grain type and the minor exporters of Central America and the Carribean produce mostly long-grain rice. Because of climatic conditions and other factors that retard efficient harvesting, storage, and milling, none of these areas now is producing a large volume of rice equal in quality to the better long-grain types milled in the United States.

The major countries of the Western Hemisphere that offer markets for United States rice are Cuba, the British West Indies, Canada, and Venezuela. Historically, Cuba has been the most important rice market

of the Western Hemisphere and it is the best present and prospective outlet for United States rice. This market is especially important to the Southern States industry (Arkansas, Louisiana, and Texas) since Cuban consumers prefer long-grain rice of the Rexora-Bluebonnet-Patna type. Current indications are that the United States long-grain rice market can be maintained if an aggressive marketing program is continued. Venezuela also prefers long-grain rice and Canada, the British Indies, and Bolivia offer possible markets for medium- and short-grain types.

Chile, Peru, and Argentina now are self-sufficient in rice, These countries were importers in the prewar period but have expanded production to the point that in most years all domestic needs are met. Although theee may be occasional shortages in the next few years in one or more of these countries, there is little possibility that a large quantity of United States rice will be marketed there because of the shortage of foreign exchange and import restrictions.

In general, the deficit-rice countries of the Western Hemisphere are not likely to require total annual imports in the next 5 years in excess of 700 to 800 million pounds annually. The nations having surpluses other than the United States may produce around 500 million pounds for export. This means that if these countries lose all their markets outside of the Western Hemisphere, the prospective markets for United States rice in this Hemisphere could decline to about 300 million pounds annually in comparison with the 800 million pounds in 1948.

United States rice markets in the Western Hemisphere for the next 5 years should more closely alproximate 600 million pounds of milled rice. In some years, there are likely to be additional markets to take part of the surplus in Europe and possibly Asia. United States rice should continue in demand as long as exporters give it preference in price-and-quality competition. Since most of the demand in the deficit countries of the Western Hemisphere having the dollar exchange is for the long-grain, high-quality types, the United States rice industry should take steps to maintain the production of long-grain rice and withhold from these markets the qualities that are likely to cause dissatisfaction, reduce the demand, and stimulate competition from other production areas.